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Good Lighting Equipment Pays

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Advantages of a good lighting system — Proper position and spacing of units for machine shops— Saving through periodical cleaning of equipment

RECENTLY a doctor in charge of the health department of a large manufacturing company stated that an employee working in the tool crib of the main machine shop came to the dispensary of the hospital and complained about trouble with his eyes. After an examination of his eyes made by the doctor and a later investigation of the lighting equipment in the tool crib, it was found that the poor lighting in the crib was the main cause of the workman's trouble.

Under such lighting conditions the possibility of mistakes is also increased. For example, the wrong size tool may be passed out and, unless the machinist obtaining the tool checks it very carefully, an expensive piece of work may be spoiled, resulting not only in the loss of time of one individual workman but also affecting the efficiency of the shop. Among other things that happen under poor lighting conditions are accidents to the workmen or machines that in either case are costly for both the employee and the employer.

These difficulties bring up the question: What is the value of adequate lighting in machine shops and other work places? It is not always possible to figure the value of good lighting in dollars and cents, except where special investigations and tests are made of installations and all important factors are considered. To prove that good lighting has a monetary value to both the workman and employer, such tests have been made in the past few years and it has been found that where good lighting has replaced poor lighting, it has improved the quality of work and increased production. In analyzing lighting for work places it has been found that bare lamps cause glare, eye strain, wasted light and harsh shadows. Scattered local lights on drop cords are a type of installation from which there is always danger of accidents, particularly where local lights are suspended on drop cords in and about belting and moving machinery. With such installations, breakage and short circuits are also possible.

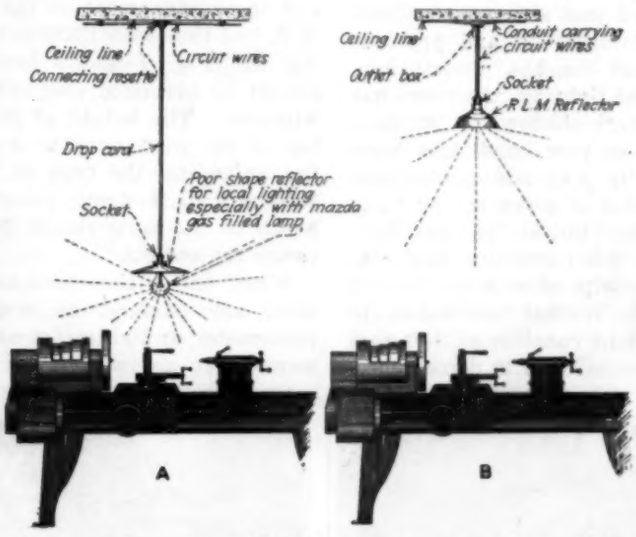


Fig. 1—Bad and good lighting arrangement for a lathe

A poor way of providing light over a lathe is illustrated in Fig. 1 at *A*. The reflector illustrated is an obsolete shape and should never be used for local lighting, especially in connection with the Mazda C gas-filled lamps. It will be noted that the reflector is not deep enough to shield the workman's eyes from the light source. The glare coming from such a unit is not only harmful to the eyes but, due to the fact that the lamp is not covered in the proper manner, a large percentage of the light goes off in directions other than where it is most needed. To eliminate such bad conditions, units of this kind should be replaced by units of a modern type as illustrated at *B*. These not only provide illumination on the working plane and other parts of the lathe or machine directly underneath but, if the units are raised to a suitable height above the floor and spaced in a symmetrical manner about the shop, they will also provide general illumination over the entire area. The shadows are then eliminated or reduced to a minimum.

When it is necessary or desirable to provide a local light over a bench or machine, an adjustable-arm bracket with a good type of reflector that will shield the workman's eyes can be installed as shown in Fig. 2. The bracket should be attached to the machine or bench

in the most convenient position for the workman. If local lighting is used to any extent, it should always be supplemented by general overhead lighting that will provide a reasonable amount of illumination in the surrounding spaces. This will not only mean safety for the workman but will decrease the strain on his eyes

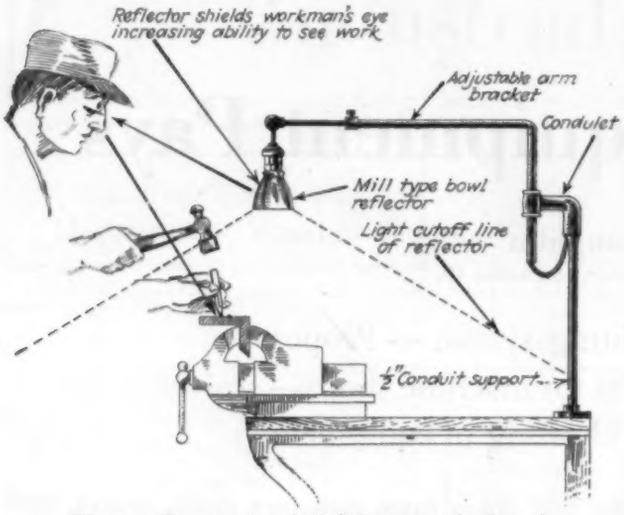

Reflector shields workman's eye increasing ability to see work
Adjustable arm bracket
Conduiet
Mill type bowl reflector
Light cutoff line of reflector
½" Conduit support

Fig. 2—Proper local lighting on the bench

when looking from the brightly illuminated work to a point in the surrounding space.

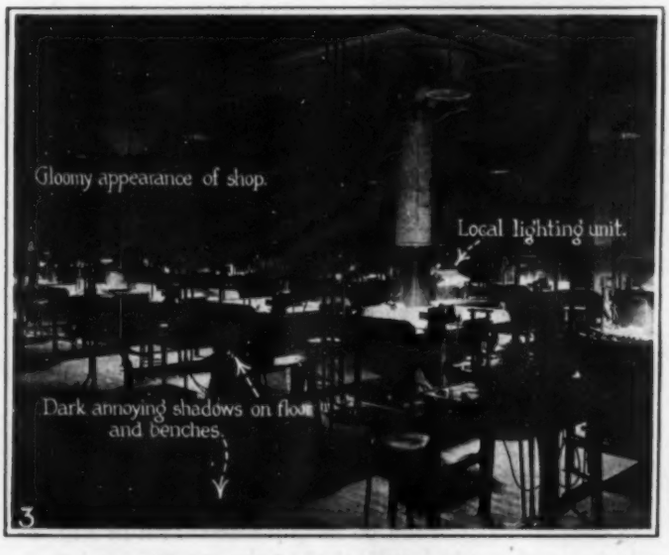
The importance of supplementing local lighting is well illustrated in Figs. 3 and 4. In comparing these two illustrations it will be noted that although the local lighting in Fig. 3 is properly installed and provides suitable illumination on the work benches, nevertheless, due to the lack of any overhead lighting, the room has a gloomy appearance and the dark shadows on the floor are especially annoying. These poor conditions have been eliminated, as shown in Fig. 4 by adding overhead lighting. A cheerful appearance is given to the room and the workmen can move about quickly and safely.

The local lighting system in this particular shop consists of 50-watt Mazda lamps equipped with the type of reflector and adjustable arm bracket illustrated in Fig. 2. The overhead equipment consists of 150-watt Mazda gas-filled lamps and standard RLM dome reflectors of a size suitable for this type and size of lamp. The units are spaced approximately 10 ft. apart and 9½ ft. above the floor. When it is absolutely necessary to use local lighting units for any particular operation on a machine, a portable floor standard with an extension cord and plug is used. This unit is made up of pipe, an adjustable arm bracket similar to the one shown in Fig. 2, and a portable reflector. Only a few of such units are required in this particular shop because the overhead lighting units provide sufficient illumination for most of the machine operations.

In preceding paragraphs of this article bad lighting practice in the use of Mazda gas-filled lamps with obsolete types of reflectors has been brought out. A similar case is illustrated in Fig. 5. In this installation 50-watt bare Mazda B lamps are used over a work bench running parallel to the window. All of these lamps are suspended on drop cords at points directly within the line of vision of the workmen when standing at the bench. This is another instance where bad local lighting caused glare, eye strain, wasted light, and harsh shadows. Fig. 6 is a view of the same bench shown in Fig. 5 with the bare lamps removed and replaced by several well-arranged and spaced units mounted above the bench. These units consist of 75-watt Mazda gas-filled frosted lamps in standard RLM dome reflectors of a size suitable for the 75-watt lamp.

In comparing these two illustrations it is very evident that the well-lighted bench in Fig. 6 is a great improvement over the same bench under the conditions as illustrated in Fig. 5. Not only do the modern reflectors and the arrangement of the units illuminate the bench well, but they also illuminate the floor space surrounding it. Fig. 7 shows how such lighting equipment should be arranged over a work bench running along windows. The height of the lighting units above the top of the work benches depends upon the spacing of the units and the type of reflectors used. With the standard RLM dome reflector the distance from the bench to the lamp should be one-half the distance between the outlets.

When one wishes to know the illumination falling upon any surface, he measures it with a portable photometer or lightmeter and, although such measurements give no information on light quality, color, or



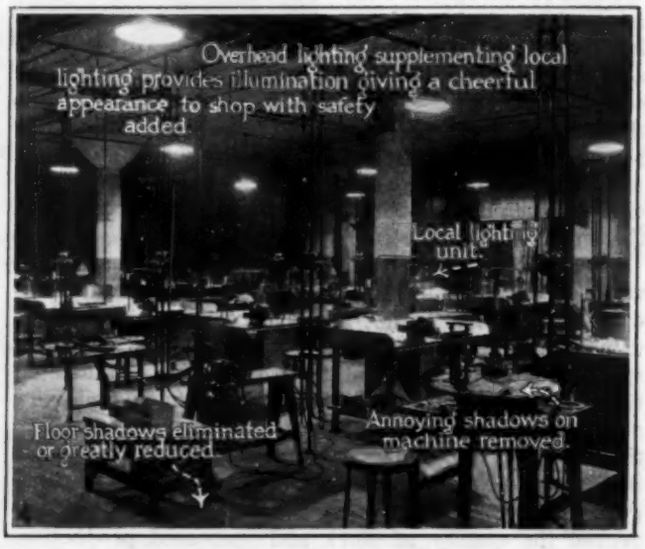
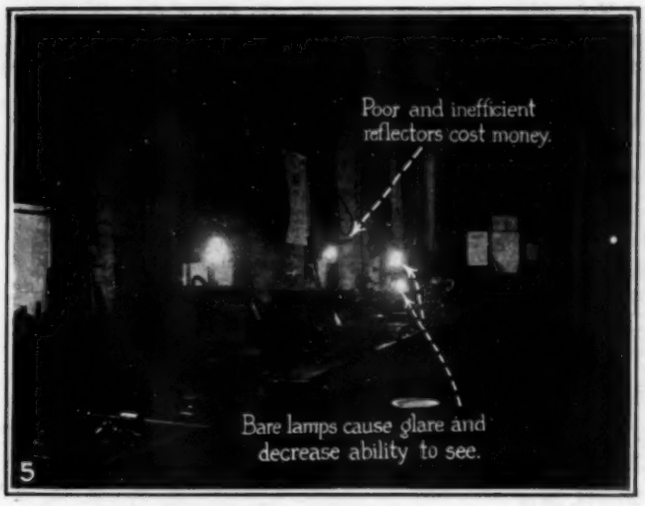

Overhead lighting supplementing local lighting provides illumination giving a cheerful appearance to shop with safety added.
Local lighting unit.
Floor shadows eliminated or greatly reduced.
Annoying shadows on machine removed.

Fig. 3—Local lighting in a shop. Fig. 4—Local lighting supplemented by overhead units



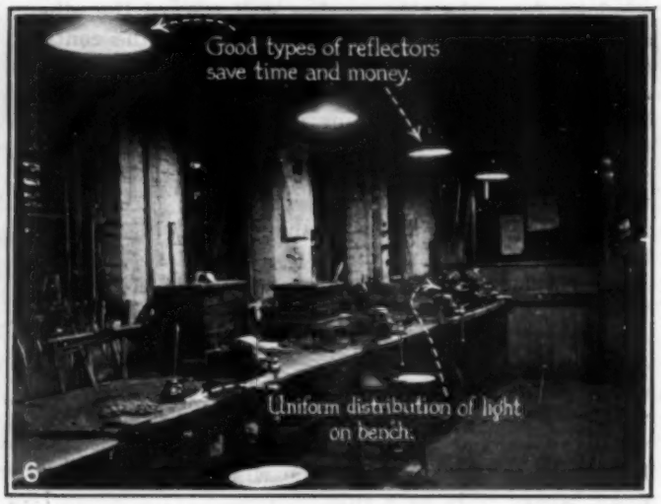


Fig. 5—Poor local lighting over a bench. Fig. 6—Improved lighting from suitable overhead units

other inherent characteristics, they do express the intensity of illumination in foot-candles. A unit foot-candle is the illumination produced upon a surface one

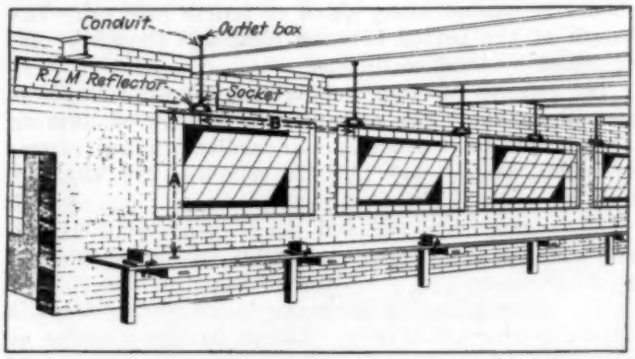


Fig. 7—Diagram of proper unit positions over benches

foot distant from, and perpendicular to, the rays coming from a one candlepower light source.

Through investigation, experience and test, a table of foot-candle values has been made up covering the various operations in industrial plants. The following is a section of such a table covering machine shops:

	FOOT-CANDLES	
	RECOMMENDED	RANGE
Rough bench and machine work..	6	4-8
Medium bench and machine work, ordinary automatic machines, rough grinding, medium buffing and polishing	10	6-12
Fine bench and machine work, fine automatic machines, medium grinding, fine buffing and polishing	12	8-16
Extra fine bench and machine work, grinding (fine work)....		10-50

One of the important points that should be considered in installing a lighting system, not only from an illumination standpoint but also from the standpoint of economy, is the method or methods for controlling the system. While the control is important in a narrow room where the daylight coming through

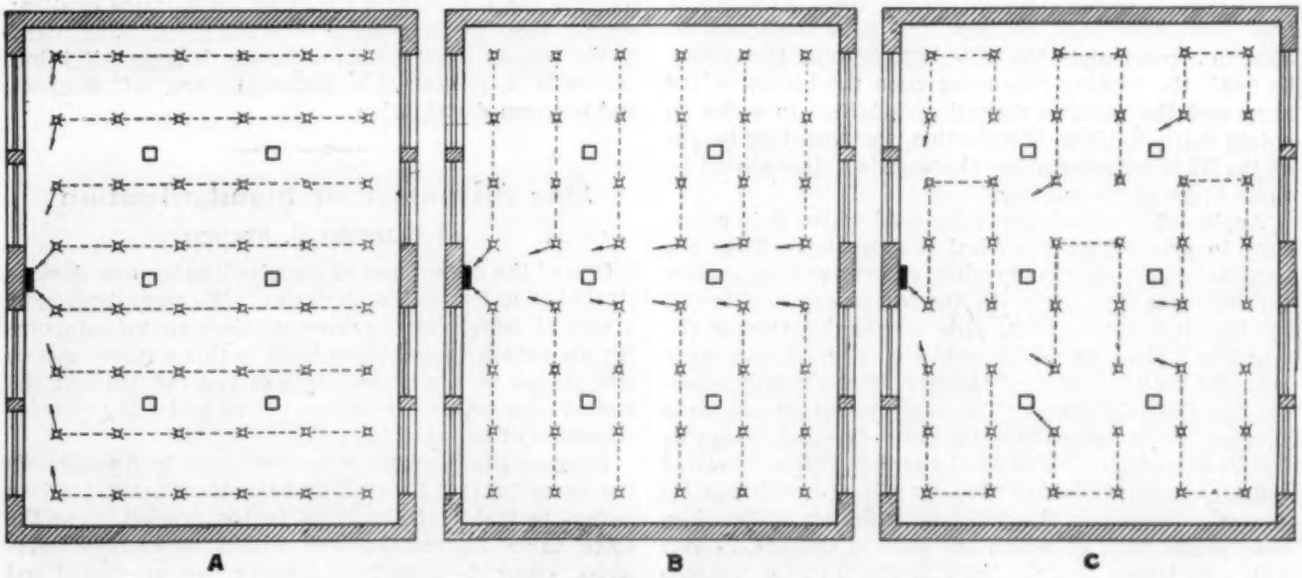


Fig. 8—Circuit wiring diagrams for a machine shop

windows from the side reaches well toward the other side, it is especially important to consider the control of lighting units in a wide room, although daylight may come from two sides of the room. Under certain local conditions the daylight in the bays adjacent to the windows may be sufficient for the workmen to operate efficiently but, if the natural light is much less in the center of the room, it is necessary to use artificial light and the method of control is important. In Fig. 8 this point is illustrated by three wiring diagrams. Diagram *A* shows the lighting units controlled on circuits running parallel to the width of the room and at right angles to the window. This arrangement causes a waste of current through the units located in the bays next to the windows, where it is as a rule unnecessary to use artificial light during daylight hours. In diagram *B* is shown a better method of control since the units are controlled in circuits running parallel to the length of the room and the windows. These lights can be turned on step by step, beginning at the center of the room and gradually working out to the windows as the daylight fails toward the end of the day. Diagram C shows an arrangement that has somewhat the same advantages as the last method, with the exception that the outlets are connected on circuits in group form. Another advantage of the last two arrangements is obtained in cases where a small section of a large shop is working overtime. It is only necessary to use the lighting units directly over such an area to provide the necessary illumination. In most machine shop lighting installations wherein there are numerous shafts, pulleys, and belts, metal reflectors coated with porcelain enamel have proved very satisfactory. The standard RLM dome reflectors with Mazda gas-filled lamps are good for general overhead lighting of machine shops. This type of reflector in sizes suitable for the 100-, 150- and 200-watt Mazda gas-filled lamps should be used where ceiling heights are from 10 to 15 feet. The smaller size for the 50- and 75-watt gas-filled lamps, is suitable for localized general lighting over small groups of machines or limited areas. For shops that have very high ceilings, the RLM reflectors in sizes to accommodate the 300- to 1,000-watt lamps may be used, the spacing depending upon the layout of the shop and the possible mounting height. In order to obtain fairly uniform illumination, the mounting height of the RLM reflector above the working place should be three-fifths of the spacing.

Angle reflectors are generally used where it is necessary to provide good vertical illumination. They are used to advantage in lighting craneway bays, where the ceiling is very high. Better results can be obtained by hanging units at the side of the bay under the crane rail than would be possible if the lamps were mounted in the center of the bay at the height necessary to clear the crane. The angle reflectors are made in sizes to accommodate the same sizes of lamps as the RLM reflector. For local lighting three shapes of reflectors are available. One type is the mill-type reflector, a second is the mill-type reflector of the deep bowl shape, both of which are used in connection with mill type lamps, and the third is the portable reflector used in connection with Mazda B lamps.

Not only is it necessary to use the right size lamp and the proper reflector to suit the lighting requirements, but it is also important to inspect and clean all lighting equipment in order to maintain its efficiency. Dirty or broken equipment causes a loss of light as indicated by chart *A*, Fig. 9, the curve showing a 4-week period of inattention. If the period of neglect is much longer, the loss may amount to from 40 to 60 per cent. All lamps and reflectors should be cleaned at regular intervals by wiping off the dust and dirt and should be washed every third or fourth interval. The length of the period between cleanings should be determined by local conditions.

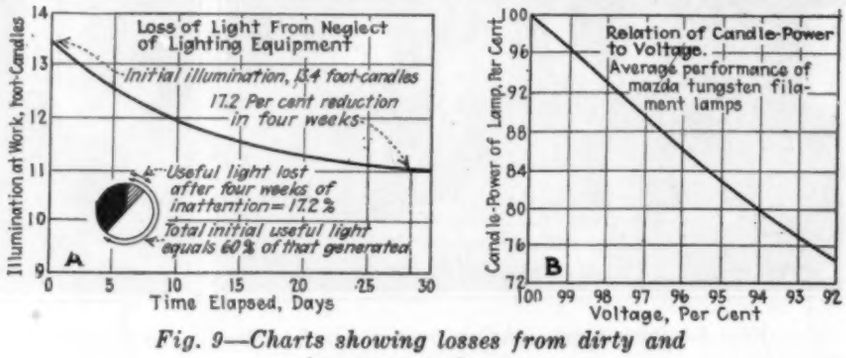

Loss of Light From Neglect of Lighting Equipment
Initial illumination, 13.4 foot-candles
17.2 Per cent reduction in four weeks
Useful light lost after four weeks of inattention = 17.2 %
Total initial useful light equals 60 % of that generated
A
Illumination at Work, foot-Candles
Time Elapsed, Days
Relation of Candle-Power to Voltage.
Average performance of mazda tungsten filament lamps
B
Candle-Power of Lamp, Per Cent
Voltage, Per Cent

Fig. 9—Charts showing losses from dirty and improper equipment

The relation of lamp and lighting circuit voltages is also important. For example, the voltage of lighting circuits has been properly standardized in two ranges of values, namely, 110, 115, 120 volts and 220, 230, 240, and 250 volts. The first range, and particularly 115 volts, is generally used and the selection of the properly rated lamp to suit the circuit voltage should not be overlooked.

The effect of using improper lamps on a circuit is shown in chart *B*, Fig. 9. Lamps having a rating of 110 volts, if used on a circuit voltage of 100, would give only 74 per cent of their candlepower, a loss of 26 per cent. With only a 3 per cent difference between the voltage of the supply and the rated voltage of the lamps, there is a difference of 10 per cent in candlepower.

In summing up it can be said that good lighting requires three things: First, light of suitable quality; second, light in the proper direction; and third, light in the correct amount. In other words a good lighting system is characterized by deflected glare, soft shadows and uniform distribution.

One Advantage of Standardization

BY CLIFFORD H. FRENCH

One of the advantages of standardization was demonstrated in our shop the other day. We recently bought a special engraving machine of German manufacture for the reason that nothing built in this country was so well suited to our needs. It was ordered without the motor, because we use motors of one make and size for a number of our machines.

Imagine our surprise when we came to measure up the motor bracket for drilling holes to suit our standard motor, to find that the holes in the bracket were the same as in our motors, well within commercial tolerances. And the holes in the motor feet are round and not slotted, as in some cases.

Locomotive Repairs at the Bellmead Shops

By Howard Campbell
Western Editor, *American Machinist*

Details of construction and operation of standard and special equipment—Machining driving boxes—Special milling fixtures—Grinding rods and links—Other operations

THE TREND of the times in machine tool design is reflected in the design of the American radial drill illustrated in Fig. 11. The feature of the machine is the air-cylinder which serves to lock the column, shown in Fig. 12. Operation of the air-control lever, indicated by the arrow, instantly clamps or releases the column, doing away with clamp bolts and wrench and saving a considerable amount of time.

The illustrations Figs. 13 and 14 show a Morton draw-cut shaper in operation machining a 21x20x24-in. cast steel driving box. The shell-fit dimension is 13 in., journal size 11 in., axle clearance 11⅛ in., and cellar

(Concluded from No. 6, p. 221)

fit 11⅝ in. The tool, which is of ¾x1½-in. high speed steel, removes approximately ¼ in. on the roughing cut and 0.008 in. on the finishing cut, running at a speed of 28 ft. per min. and feeding ⅛ in. per stroke. The piece is machined to drawing limits, complete with shoe and wedge fit, in from 2½ to 3 hours.

The milling machine is finding favor in the railway shops with the increasing utilization of high production methods. The use of a milling machine with a special fixture is illustrated in Fig. 15, milling the guide fit on a cross-head. The job is done with a 5-in. 12-tooth spiral cutter, running at a speed of 26 r.p.m., a ¼ in. cut being taken at a speed of 3⅛ in. per min. The piece

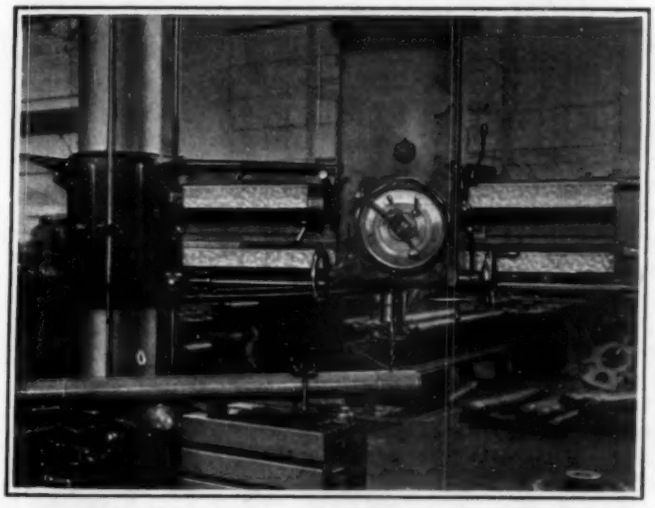


Fig. 11—Latest type American radial drill

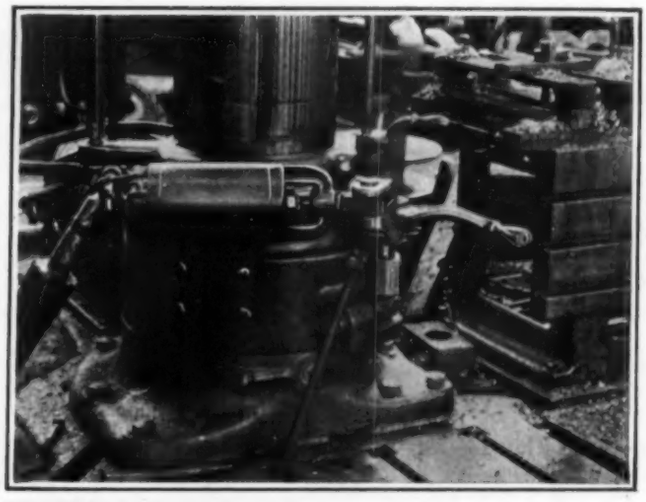


Fig. 12—Air-clamp on radial drill column

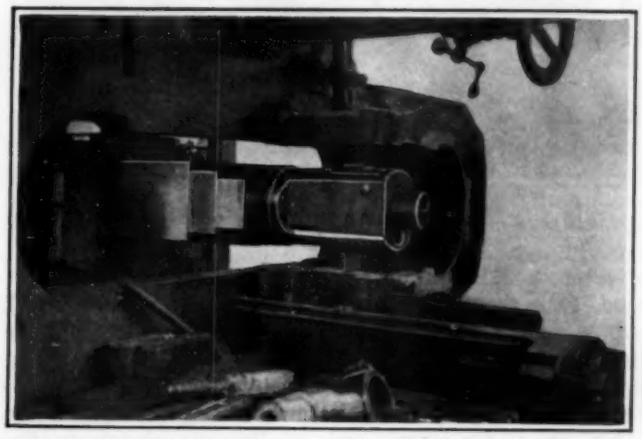


Fig. 13—Machining a cast steel driving box

Fig. 14—Shaping journal fit

is laid out in the fixture in which it is machined, the jacks being placed under the side nearest the cutter after the lines have been drawn with a surface gage. A cross-head can be laid out and machined complete in approximately 3 hours. (A new fixture is in process which will reduce this time to one hour.)

A Norton grinder, set up to grind a piston rod, is illustrated in Fig. 16. The piece is driven by means of a stud in the piston head, which slips into a slot in the face plate. The wheel is a 24x3x5-in. 36-M

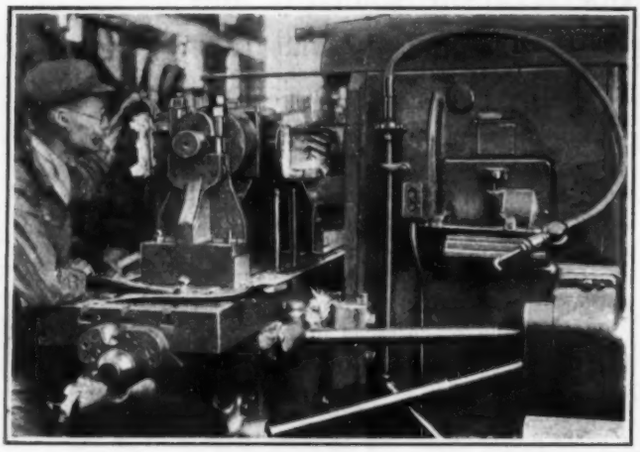


Fig. 15—Milling guide fit on cross-head

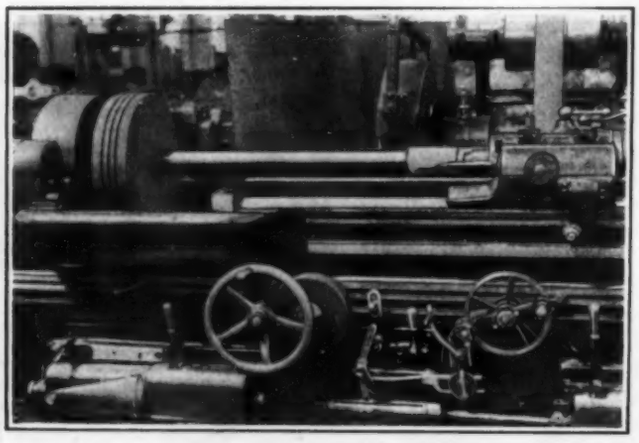


Fig. 16—Set-up for grinding piston rod

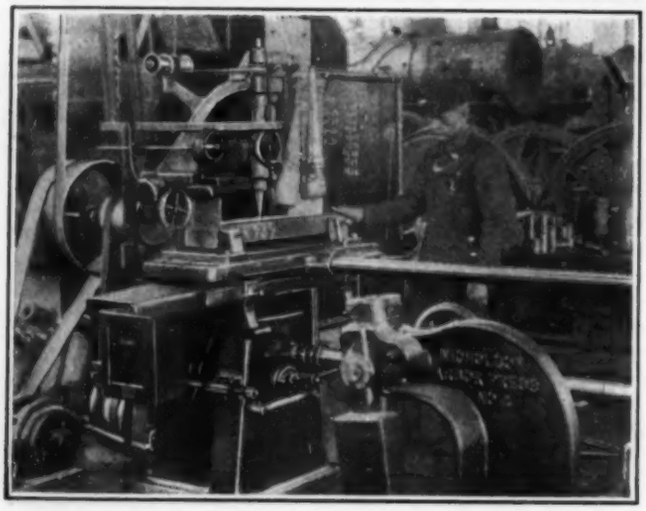


Fig. 17—Link grinder in operation

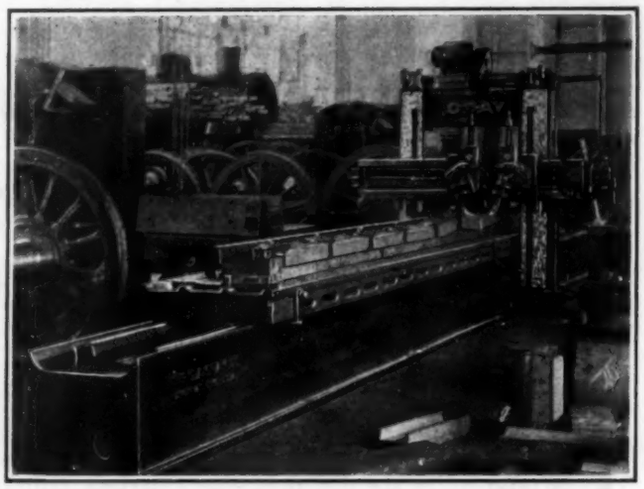


Fig. 18—Shoes are machined on the Gray planer

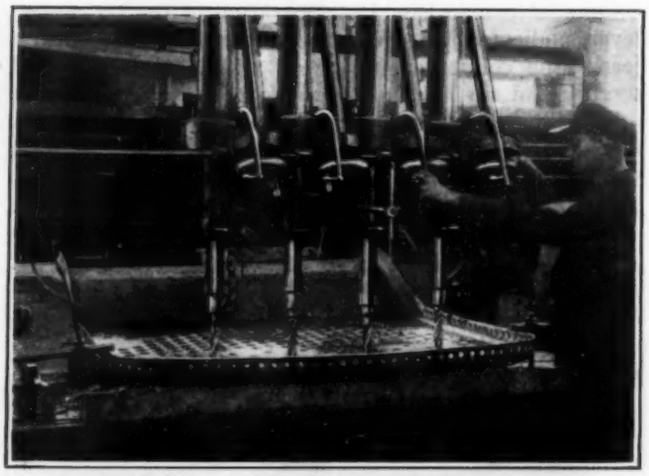


Fig. 19—Drilling and boring back flue sheet

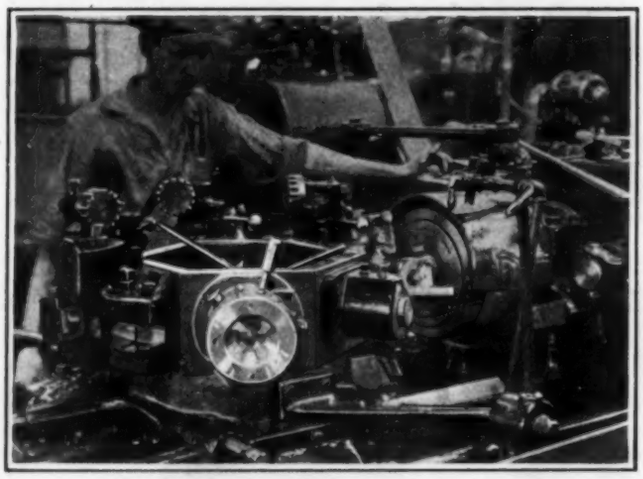


Fig. 20—Making 300 patch bolts in 8 hr.

Norton, and runs at a speed of 1,600 r.p.m. A worn rod, such as is shown in the illustration, can be trued up in approximately 30 minutes, and a new rod can be ground in about the same length of time.

Links are ground on the machine shown in Fig. 17, which is made by H. C. Hammett, Troy, N. Y. Links that are badly worn, such as the one shown in the machine, are trued up and blocks made to fit. A link

can be trued up in approximately an hour, and a block can be trued up in about the same length of time.

Shoes are planed on the Gray planer shown in Fig. 18. The shoes are cast with $\frac{1}{4}$ in. of stock on a side, of which $\frac{3}{8}$ in. is removed in the first cut and $\frac{3}{8}$ in. in the second, using a $\frac{1}{16}$-in. feed. The shoes shown are $7\frac{1}{2}$ in. wide and the eight pieces are machined on the outside in approximately 1 hr. 20 min. The same amount of time is required to machine the inside.

The operation of drilling and boring a back flue sheet is shown in Fig. 19, a Moline 4-spindle drill being used for the job. Soda water is used as a coolant. The task of drilling 150 $1\frac{1}{16}$-in. holes and boring 21 $4\frac{33}{64}$-in. holes can be done in 2 hr. 50 min. on this machine.

Patch bolts are made in a No. 2 Warner & Swasey screw machine, shown in Fig. 20. The material is $1\frac{3}{8}$-in. screw stock and runs at a speed of 188 r.p.m., a $\frac{3}{4}$x$1\frac{3}{8}$-in. high-speed steel turning tool being used which feeds $3\frac{1}{2}$ in. per min. The Warner & Swasey micrometer adjustment provides for quick adjustment of the tools and the threading is done with a Geometric die, as shown. A production of 300 patch bolts in 8 hr. is obtained with this set-up.

The Value of the Machinists' Trade as Foundation for a Career

By Joseph Biley

[This article is the prize winning essay of the fourth-year apprentices of the Warner & Swasey Co., Cleveland, Ohio. The prize awarded was a trip to another machine tool city in company with the apprentice school instructor.—Ed.]

One of the saddest things in the world is the sight of a young man wandering aimlessly through life with no definite occupation, hoping that some day he will stumble into a soft snap that will solve the question of making a living. The work he is doing came to him by chance and he will continue doing the same thing until chance turns him in some other direction. He is in no sense master of himself or of his fate, but only drifts about like a piece of bark tossed from wave to wave on the sea.

At the age when a young man should choose a career he should consider the big things that really count before making his decision. He and his work will be companions during his entire life, and he should be sure that it is the kind of companion that will be entirely agreeable.

A liking for the work is one of the most important considerations. If the actual work to be done is distasteful, it will be difficult to be entirely happy, even though other things are favorable. On the other hand, if one enjoys every hour of his work, that fact will make up for many undesirable things about it.

The machinists' trade seems to fascinate the young man who cannot afford a college education. If a labor census should be taken, it would be found that the largest group of skilled workmen in the metal trades are classed under the name of machinists. Still, it is noticed that the proportion of men in the industry qualified to direct and supervise grows smaller every year. This is due in part to the rapid growth of the industry, and in part to its failure to provide an adequate training for the non-commissioned officers of its working force.

There is one big danger a young man should look out for in this trade—that is over-specialization. This is found in production shops where the man becomes a mere machine. His work may be the operation of some machine day after day, and year after year. While high specialization leads to great skill, it may not be the best thing for an individual, as mere routine work done year after year tends to make one narrow in his view. In justice to himself he should keep in touch with the other men's work, as well as his own.

One of the favorite ways of training boys in the machinists' trade is by apprenticeship. This method has the advantage of producing thoroughness and opportunity for advancement, both of which are very important to the young man. A small salary with a chance to grow and the prospect of a steady raise would be better than a position paying more, with no chance of advancement.

There are at present few concerns in Cleveland that give a young man such mechanical training, through which he can secure good results, if his ambition is directed in the proper channels, and his effort be made intelligently. We have many examples of men who developed themselves into high, well-paid positions, with the machinists' trade as their foundation.

The dependence of the constantly increasing population of the world on machine-made products has made the work of the man with mechanical knowledge unavoidable. An important fact is that the demand for the right man can never grow less; there can never be too many of them.

Some Men Get Only Routine Jobs

There are men today who have some general intelligence, are respectably honest and frequently of a good social position and yet who can get only routine, poorly paid positions. They can do "almost anything," they say, which really means that they can do nothing. The successful man of today is he who knows how to do one thing better than most other men can do it. It is therefore better to work at that trade in which he spends the greater part of his working hours, and he will rise more easily from the working to executive class.

Some young men complain that they cannot develop themselves by learning the machinists' trade. While this may be true to a limited extent, no kind of work can hold a man down if he has the determination to learn and advance. If they would give more attention to doing their own work well instead of looking with longing eyes at the man above them, their work would be done better and advancement would be more certain.

Shortcomings is a repulsive word, but we meet it wherever we look for a career. In the case of the machinists' trade the disadvantages are temporary, for the young man who is in earnest, but they should be part of his inspiration. On him as an individual depends, in some measures, the good of his trade; he may raise or lower its standards according to his will and performance.

A person who has been successful in his life's work will be developed physically, mentally and spiritually; will have been a value to his trade or profession and to mankind; will have tasted happiness; and as he looks over his life, he will see the actual results of his efforts.

Success means effort; "there is no excellence without labor." The keynote of success in any occupation is to learn it from the bottom to the top, then play the game for all it's worth.

Observations from the Wildwood

By R. B. Willis

"WELL! Well!" said the old-fashioned foreman, interrupting an informal talk about how we'd do the 8400-C's this time, "That's the first man I've hired in 15 years that knew enough to true up the live center without being told. Actually to true it up, I mean, by taking off some stock to make it run true."

"It's always the same," he went on. "'Oh, yes! I trued up the center.'"

"Did you turn it up with a tool?"

"'No! I put it into the spindle and it *looked* all right.'"

"Well! you'd better turn it up with a tool or it won't run exactly true: then when you put the dog on the other end the two diameters won't run the same and the piece will be no good."

We agreed that if there were some way to make machinists read Chordal there would be less poor work from poor centers, because Chordal said some things on this point that would stick in anyone's mind.

Of course this talk took place in a country shop, or there might not have been an old-fashioned foreman with power to hire and fire. I read some years ago that the old-fashioned foreman, always described as ignorant, blustering, and unjust, was gone for good and all.

But isn't it just possible that he sometimes had the right on his side? Who knows the struggles with his conscience when he kept some man on awhile to see if he wouldn't brace up and produce? Many a day's pay has been collected by some man that didn't fit the shop, while the foreman was hoping for some appearance of worth and dreading the disagreeable job of firing. If he sometimes fired a man in a peremptory manner, isn't it possible that he had stood about all he could be expected to stand?

I read recently that the success of a manufacturing business depends upon the foremen. This might appear to be a brand new idea, but the old-fashioned business man knew it long ago, and because he knew it, he left the foreman free to decide whom to keep and whom to let go. I think if we could get right down to facts with some men who have succeeded in business, we would learn that being fired by some foreman was the greatest favor they ever received.

The foreman still exists in many a small shop and still fills the place of planning department, tool designer, and so on, and when such a shop takes a contract to manufacture machine parts, just watch it go—that's all.

What I started out to say, however, is that many machinists fail to grasp some of the simplest ways to get good work. A story the foreman often hears is that "the first piece turned straight, the next was small at the end, and the next was big at the end." If the lathe has been used a few years, the footstock spindle will not be so good a fit as it was once. Even if the spindle is clamped each time, the work may not turn straight, because the clamping may not always be of exactly the same degree of tightness.

To overcome this, the footstock-spindle clamp handle can be set so that there is some friction and left there while the lot is being turned. Then the pieces will be turned all the same. Sometimes a hexagon nut is put on in place of the clamp handle, because it is hard to overcome the habit of loosening it, and if loosened, the setting is lost.

Setting the footstock to turn straight or taper offers great difficulty to many. Usually the adjusting screws will be found set up tight enough to "hold the whole shop," as my friend puts it. Once the adjusting screws are set finger-tight, we can begin to get the right setting because the movement will then be according to the adjustment.

It is interesting to see how a little thing will mount up in cost. Some years ago we made a lot of drill jigs for a customer, and one of them came back with the criticism that one hole was out four or five thousandths. Our inspector spent hours trying to find the error, which did not appear to be there. Finally the jig was sent again to the customer and reported all right.

The customer's inspector read the proper side of his height gage that time. If he had noticed the number of inches the first time as well as the thousandths, several dollars would not have been spent.

Aisles, Cranes and Pits in Locomotive Shops

Some interesting suggestions as to locomotive shop design and crane equipment were brought out at the recent railway convention at Atlantic City, as a result of questionnaires previously sent out.

The recommended average width of aisle for a locomotive shop with transverse pits is 85 ft., although 100 and 120 ft. were suggested. Both steam and electric locomotives were considered. The pits should be spaced with a center distance of 23 to 25 ft. Aisles 15 to 20 ft. longer than the locomotives were advocated by some delegates.

Recommendations for traveling cranes varied from two 60-ton cranes to single cranes varying from 100 to 250 tons. The great majority favored cranes with a capacity of 200 tons or over, due to the constantly increasing weight of modern locomotives. It is generally considered that one large crane will serve between 20 and 30 pits satisfactorily.

For handling auxiliary parts in the erecting aisle, the majority recommended 10- to 15-ton cranes. One member suggested a 5-ton crane and another a crane as large as 40 tons, but a 15-ton crane appeared to be the most popular. There was considerable difference of opinion as to the number of pits that could be properly served by one auxiliary crane, from 5 to 15 pits covering the great majority of recommendations. Extremes ran from 4 to 26 pits per crane.

The desired capacity of auxiliary cranes also elicited numerous opinions, the size varying from one 5-ton crane to two 20-ton cranes. From 10- to 15-ton cranes were, however, considered the most desirable by a large majority. The auxiliary cranes should serve all the larger machine tools such as wheel lathes, wheel presses, quartering machines, cylinder planers and borers, slab millers and frame slotters.

The advantages of balconies in shops were conceded by about half the railroads. Where balconies are used they generally contain the tin, pipe and electric shops, tool repair and manufacturing, air brake, injector and lubricator work, paint, wood and pattern shop, as well as turret lathes. The location of locker and wash rooms varies according to the shop. Both first floor and balcony are recommended.

Electrical Equipment for Machine Tools

By John W. Harper

Conclusion—Devices giving protection from overload — Dynamic braking—Push button and jogging control—Alternating and direct-current motors and their uses — Types of winding

OVERLOAD protection is usually provided by means of a relay having coils in series with the motor and normally-closed contacts in series with the line-contactor coil. An overload on the motor, with consequent excessive current in the series coils, acts to open the control circuit, de-energiing the line contactor and disconnecting the motor from the line. If a motor is stopped because of an overload, a condition exists which should be investigated. For this reason hand-reset, overload relays are recommended. The motor cannot then be started until the operator has gone to the equipment and reset the relays. This will show him that something is wrong at the motor and necessary steps can be taken to have the trouble remedied.

The form of protection most generally used is that of "inverse time." That is, the time taken by the relay to trip is inversely proportional to the severity of the overload. Two types of relays are ordinarily used—dashpot, and thermal. In the dashpot type of relay a plunger is raised against the opposition of oil or air in the dashpot. A valve is provided by means of which the time element may be varied. By this arrangement the motor is not disconnected from the line with every fluctuation in load, but is protected against serious overloads. In the case of the thermal type the coils are mounted below strips of thermostatic metal. The heat from the coils when carrying an overload causes the strips to deflect, allowing contacts in the control circuit to open. An adjustment is provided for varying, through a limited range, the current in the coils necessary to trip. Figs. 6 and 7 show the dashpot and thermal types of overload relays.

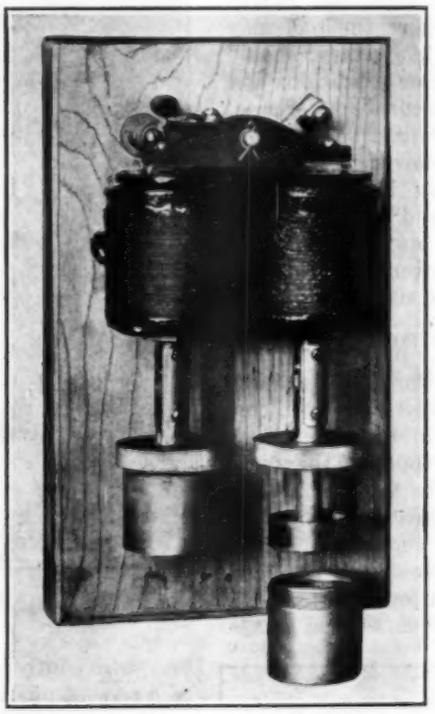


Fig. 6—Inverse time, two-circuit overload relay—dashpot type

Another form of inverse-time overload protection is provided for small motors by means of thermal cutouts or "protective plugs," as shown in Fig. 8. These cutouts contain a stationary contact post with a heating coil and a fusible link which holds a spring contact arm to the stationary post. The fusible link is made of two parts held together by a low-fusing alloy. The motor circuit is completed through this link. With excessive current through the heater coil, the alloy melts, allowing the link to open. This releases the spring arm and opens the motor circuit directly, instead of opening the control circuit as in the other types. The use of these cutouts is limited to small motors.

Dynamic braking is a function provided in some forms of direct-current magnetic control and some drum controllers. This is accomplished, in the case of magnetic control, by the use of an auxiliary contactor mechanically interlocked with the line contactor and which has its coil connected across the motor armature. As soon as the line contactor opens, the dynamic-braking contactor closes, connecting a resistor across the motor armature. The motor then operates as a generator, the electrical energy due to the momentum of the revolving armature being absorbed in the external resistor, and dissipated as heat. In this way the motor is brought to rest very quickly, the time required depending to a large extent upon the ability of the motor to commutate the braking current. To obtain efficient braking with an adjustable-speed motor, it is also necessary for the control to provide means for putting normal voltage on the motor field during the braking period.

While plugging (suddenly changing the connections of a motor from one direction of rotation to the other) is used in some special applications of reversing motors, it is not considered desirable for machine tools generally, because of the added complication in control apparatus to insure obtaining full-load torque at starting. This is especially true for adjustable-speed motors. Dynamic braking is particularly necessary on reversing equipments. The braking contactor, since its coil operates from the motor counter emf. closes as soon as one line contactor is de-energized and will not open until the motor speed and consequently the counter emf. has fallen to a very low value. Therefore, it is necessary for the motor to practically stop before the reverse contactor can close.

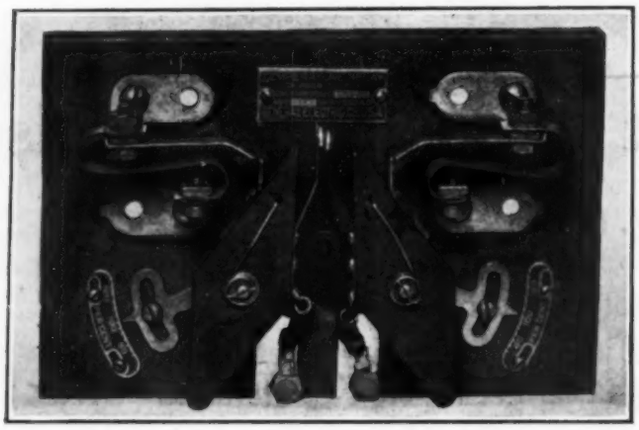


Fig. 7—Thermal overload-relay

This feature is of great importance in reversing planer-equipments and the like, where the time saved by stopping the motor quickly effects a considerable reduction in the production time. This feature is applicable to d.c. motors only in the form as outlined above.

Dynamic braking also provides an important safety feature when used with machines where the tool may have to work up to a shoulder. If voltage should fail at the end of the stroke under these conditions and no provision were made for accurate stopping, the momentum of the tool or work might be sufficient to jam the tool against the unremoved stock with disastrous results. Dynamic braking if provided, is operative even if voltage should fail and will act to stop the motor quickly. To take care of such possibilities, an emergency braking section is often furnished to stop the motor in the shortest possible time.

Simple Method of Control

Operation by means of push-button stations and magnetic controllers forms the simplest and most convenient method of controlling machine tools. Push buttons are easy to operate—a slight touch of the finger will start the largest motor. Due to their small size they may be readily mounted where most convenient. A typical installation of this kind is shown in Fig. 9, If the machine is such that they would be required, it is possible to install several stations so that the operator can have complete control from several points.

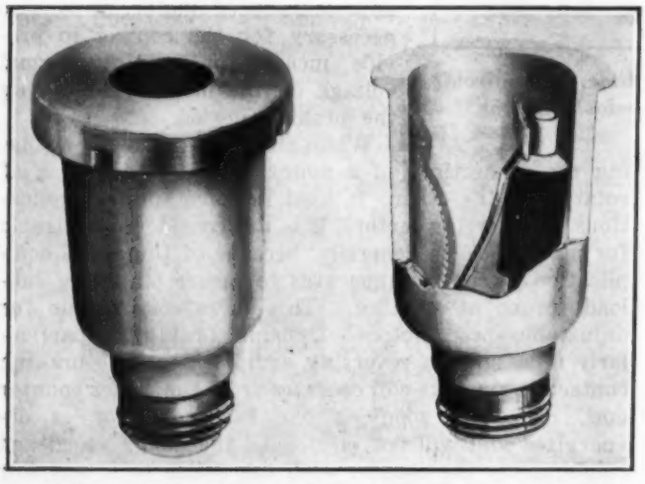


Fig. 8—Time-element thermal cutouts for small induction motors

An example of this would be a large boring mill, where a push-button station arranged as a pendant switch may hang inside a large casting, giving the operator complete control from inside the casting as well as outside. Where several stations are used, a locking device is available by means of which the control circuit can be locked open. In this way an operator making adjustments can be sure that no one can start the machine without warning him. All the functions of start, stop and speed change can be readily taken care of by push-button control.

When setting up new work on some machine tools, as for instance the matching of dies on punch presses, it is often necessary or desirable to move the machine a small amount, or "jog," to get the work properly located. This can be readily provided for on any

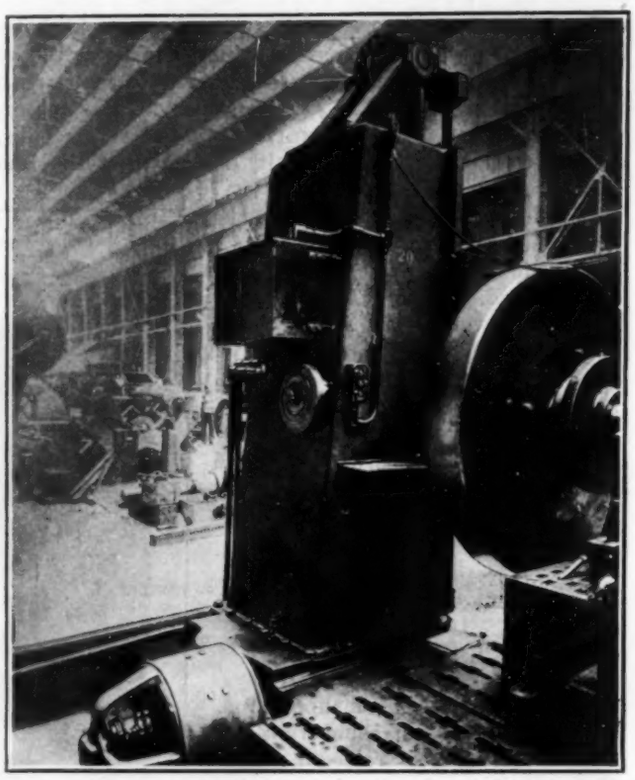


Fig. 9—Push-button control on a boring machine

magnetic control using push-button stations. By means of a special push-button station, the control is arranged so that the line contactor will remain closed only as long as the button is depressed. This means that the motor can be moved almost any amount desired. With drum control it is possible to obtain small movements by moving up to the first point and then backing off.

Since the foregoing has had to do chiefly with the general features of control equipment, it might not be amiss to give a brief summary of the various types of direct and alternating-current motors, giving briefly their characteristics and where they fit in to machine tools to the best advantage.

Adjustable, varying-speed motors are those in which speed regulation is obtained by inserting resistance in series with the armature circuit. Under these conditions the speed reduction at any load depends upon the torque requirements of the motor at that particular load, and the speed may vary over a considerable range for any setting. This is a wasteful method,

Fig. 10—Reversing motor and magnetic control applied to a planer

in that energy must be absorbed in the external resistor. However, applications such as bending rolls require such an arrangement.

Another method of speed regulation is by means of adjustable-speed motors. In these motors, the speed change is obtained by varying the field current. This method is more economical than the former and has the further advantage that a much wider speed range may be obtained. Furthermore, the speed remains practically constant at any given setting regardless of the load.

When a very wide speed range is necessary, a combination of both armature and field regulation may be used, but for all speeds below the basic, or full-field speed, the motor is in the adjustable varying-speed class, and the load determines the speed obtained.

Shunt-wound motors are applicable for drives demanding constant load and where fairly close speed regulation is required. They should also be used where

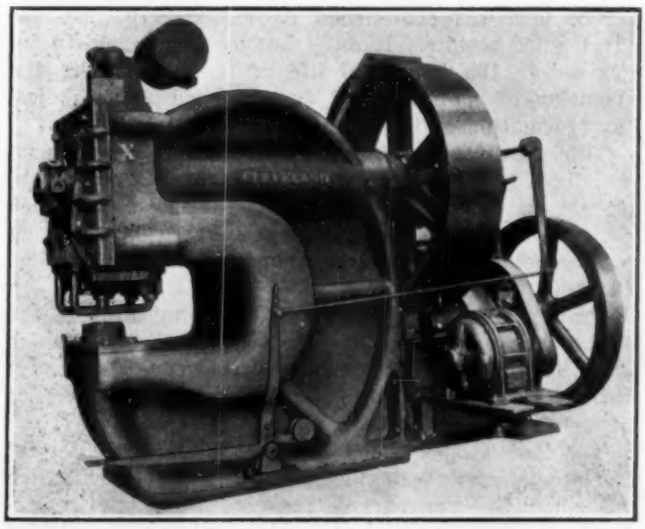


Fig. 11—A motor-driven punching machine

adjustable-speed motors are necessary. In general, they should be used on all machine tools which remove metal by means of a cutting tool or abrasive. They are also applicable to punch presses and similar flywheel loads where the actual work strokes are 35 per min. or more. Under these conditions the flywheel cannot slow down and then store up enough energy between strokes and the motor must carry the load. Rotary shears should also be supplied with shunt-wound motors. Fig. 10 shows a d.c. adjustable-speed, shunt-wound motor with magnetic control, mounted on a planer.

Compound-wound motors should not be used for adjustable-speed service, but are suitable for adjustable, varying-speed and so-called constant speeds. They are applicable to drives demanding high torque peaks, or comparatively high slip, which includes machines for forming or bending metal, such as bending rolls, shears (except rotary), presses where the actual work strokes are less than 35 per min., etc. Compound-wound motors are also used where heavy starting duty is required, as, for instance, cross-rail and tool traverse.

Series-wound motors are used where high torque or high slip is demanded and where high speed at light load is not objectionable. Such motors should never be belted, but should either be connected directly or geared to the load.

Squirrel-cage motors are similar in general to shunt-wound d.c. motors, except that no speed regulation is possible. The applications for which they are suitable are the same. Standard squirrel-cage motors are suitable for ordinary starting duty only.

Motors for Heavy-Starting Duty

Where heavy starting duty is required, or heavy loads of short duration are encountered, as in flywheel presses as shown in Fig. 11, squirrel-cage motors with high resistance rotors are recommended. Such motors have a higher slip than standard motors, which means that the full-load speed will be ten to twelve per cent below synchronous speed, instead of four to five per cent as obtained on standard motors. When used with flywheel machines, the increased slip allows the flywheel to deliver a greater amount of energy before the motor is carrying full load.

Alternating-current motors with external secondary resistance are used in a manner similar to compound-wound d.c. motors. They are used where some speed regulation is necessary and, under these conditions, correspond to adjustable, varying-speed (armature control) d.c. motors, since the current consumed in the resistance to reduce the speed is wasted. These motors are not recommended for speed reductions of more than fifty per cent, as their operation is unstable below that. The speed is also dependent upon the torque requirements. By inserting a permanent resistance in the secondary, these motors can be used on large presses, etc., and will operate in a manner similar to the high-resistance-rotor motors. The use of the external resistor reduces the heating of the motor, since the heat is generated in the resistor away from the motor itself. With the squirrel-cage motor the heat is all in the motor.

It is difficult to obtain as wide a speed range with a.c. motors as with direct current. The nearest approach to this is the commutator-type brush-shifting motor, which gives a speed range of three to one by shifting the brushes. These motors are rated on a

constant-torque basis and are not particularly suitable for general machine tool applications, principally because they must be rated at basic speed, which results in a large and expensive machine. Their characteristics are similar to the shunt-wound motor, in that the speed when set, remains practically constant for all loads.

Multi-speed motors can be used where three or four definite speeds in conjunction with a gear box will be sufficient for the service. Where two-phase service only is available, standard three-phase motors and auto-transformers are recommended. Where the two phases are symmetrically interconnected auto-transformers cannot be used, and transformers having separate primary and secondary are necessary.

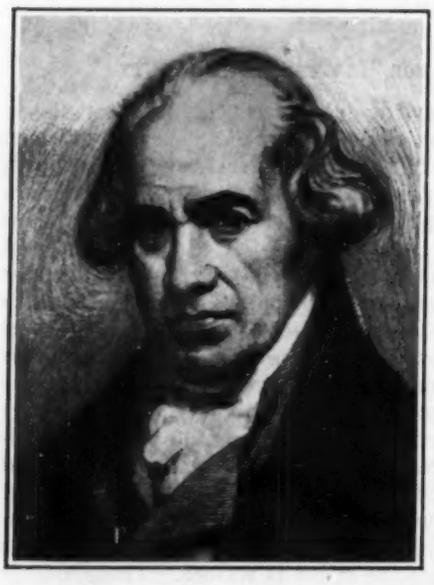
Famous Machinists of History

By H. H. Manchester

James Watt (1736-1819)

James Watt may well be included in our list of machinists who became famous, because, at two periods of his life at least, he was a practical machinist—first, at the beginning of his career; and second, in his declining years.

He was born in Greenock, in 1736. His father had several occupations, among which were instrument making and building, and he was also listed as a merchant. James was a delicate boy, and, in fact, had trouble with his health for many years. He attended a grammar school, and in addition to the ordinary branches learned something of geometry and also of languages. Throughout his youth he worked in his father's shop, and became particularly dextrous in the construction of models which required exact or delicate work.



At about eighteen he was apprenticed to John Morgan, instrument maker of Cornhill, London. But he found the air there unsuited to his health, and returned to Greenock.

When about twenty-one he went to Glasgow, and attempted to set up an instrument making shop there, but was prevented by the guild of hammermen, because he had not passed through the regular stages as apprentice and journeyman.

His friend, Anderson, however, got him appointed instrument maker in the University of Glasgow, and he started a small shop there, where it was out of the jurisdiction of the guilds. Here he made various scientific instruments, and even musical instruments, including an organ.

In 1760 he was permitted to open a larger shop. Four years later he was required to repair the university's model of the Newcomen fire engine, as the steam engine was called then. He noted its immense consumption of steam, and realized that this could be avoided by using a separate condenser, and took out his patent for an engine based on this principle in 1769. His first partner was Roebuck of the Carron Iron Works, after the failure of whom, in 1772, Watt became connected with Boulton, and in 1775 went into partnership with him.

In 1780 Watt patented a method of copying letters by means of a press, which was very widely used.

Pickard, who had been employed by Watt, had already patented a crank for changing the reciprocating motion of Watt's engine to a rotary one, and the next year Watt himself patented five methods for transforming reciprocating to rotary action.

In 1782 he produced a double acting cylinder involving the use of expanding steam.

From 1782 to 1800 Boulton and Watt fought through a number of suits to maintain the validity of their patent, and it was uniformly sustained in the court of last resort.

Both Watt and Boulton retired in 1800 and left the management of their business to their sons.

Watt fitted up the garret in his Heathfield home as a workshop, and experimented there for the last twenty years of his life. The shop included crucibles of metal and stone for casting, a foot lathe, a potter's wheel, and in fact the chief appliances used for working wood or metal at the time.

One machine he was experimenting with was a lathe to make exact copies of irregular forms, such as statuary and furniture.

Watt died in 1819. His steam engine produced a new epoch, and may be said to have marked the beginning of modern times.

The Working of the Eight-Hour Law in France

Monsieur Jouhaux, the French delegate to the labor bureau of the Society of Nations, and Monsieur Justin Godart, the new French minister of labor, have submitted a report on the working of the eight-hour law in France, of which the main points are as follows:

The law was established April 23, 1919, and has given good results. It daily becomes more solidly ingrained in the industrial life of the country by the evolution of manners and customs and a methodical transformation of the material means of production.

Thirty professions, grouping five million wage earners, have improved their conditions of labor and employers and employees have thus been able to approach each other under a mutually recognized law looking to an amelioration of relations and an improved method of work and production.

France has no intention of foregoing any of the advantages gained by the adoption of the law which will be maintained, and desires furthermore the prompt ratification of the terms of the Washington conference as well as that of Geneva.

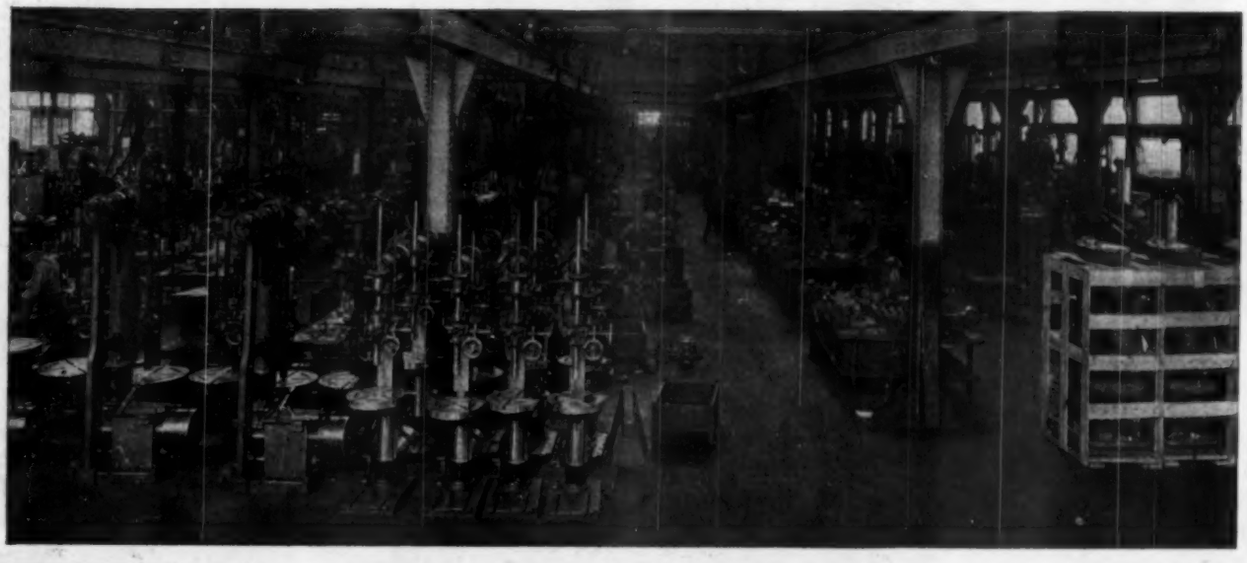
The French Office of Labor, under the new Herriot ministry, is soon to publish an official report which will show the workings of the eight-hour law in particular as well as all labor developments and legislation in detail.

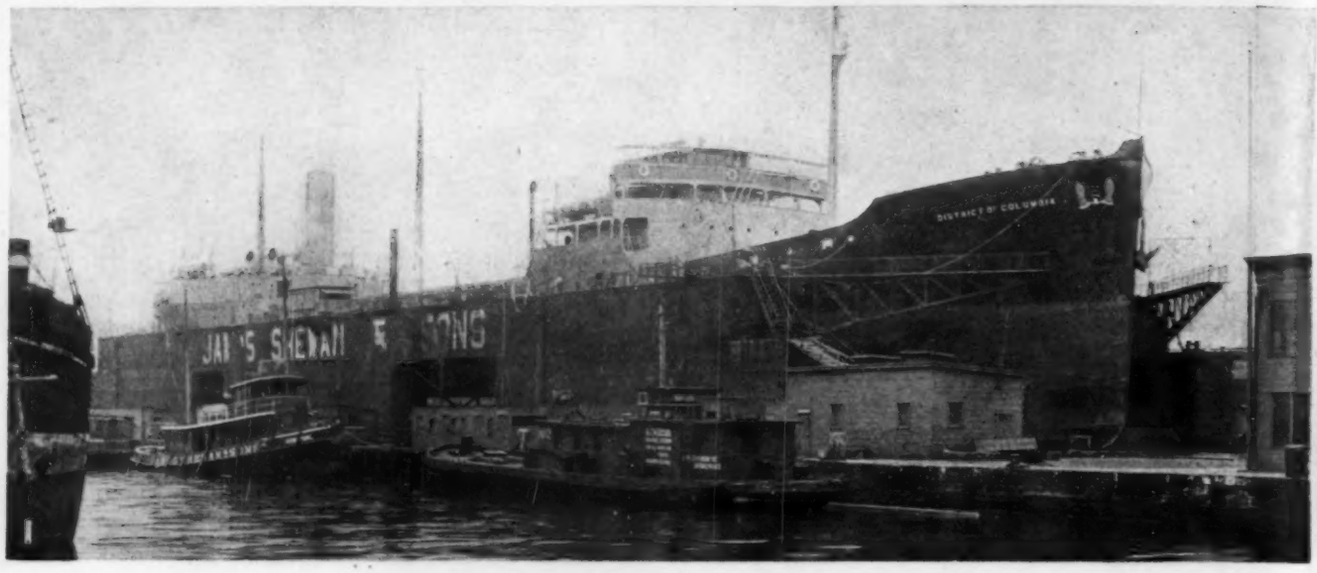
Where Machine Tools Are Made

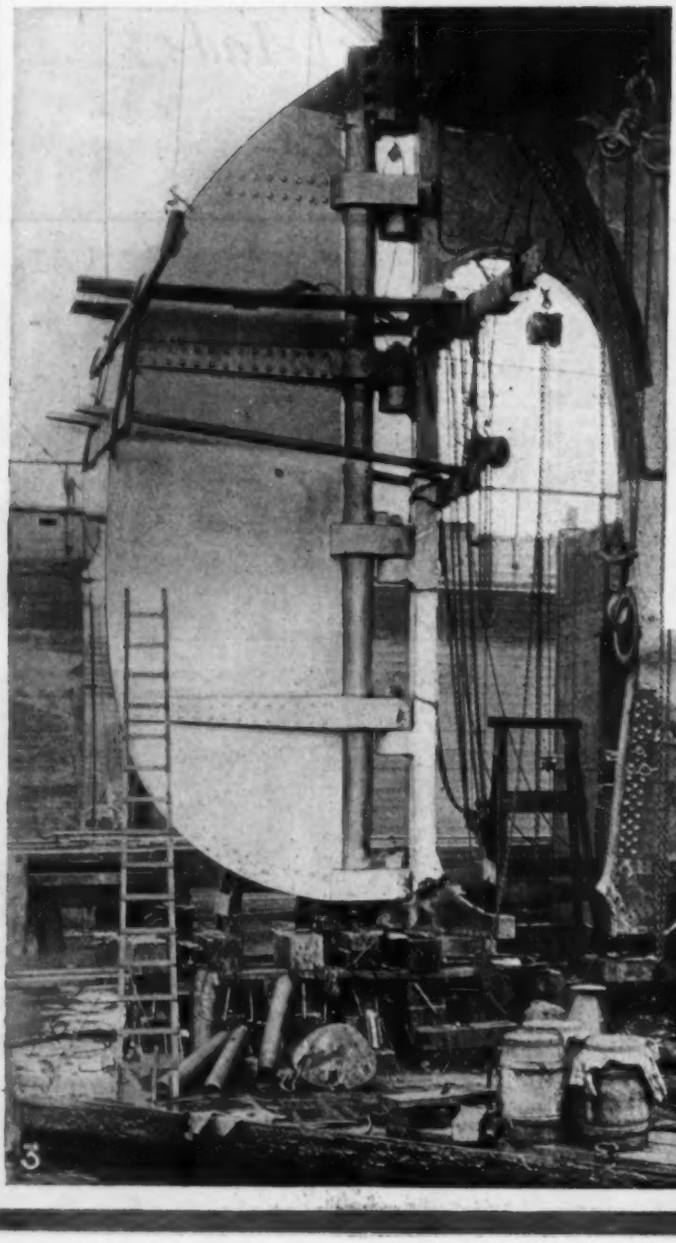
The Cincinnati Bickford Tool Company

Oakley, Cincinnati, Ohio

Established 1874







Repairing the Tail of

Fig. 1—The ship District of Columbia in dry dock awaiting repairs to her stern post

Fig. 2—The stern frame before the defective section had been removed

Fig. 3—After the defective section had been cut out

Fig. 4—The piece cut out had defects at both ends

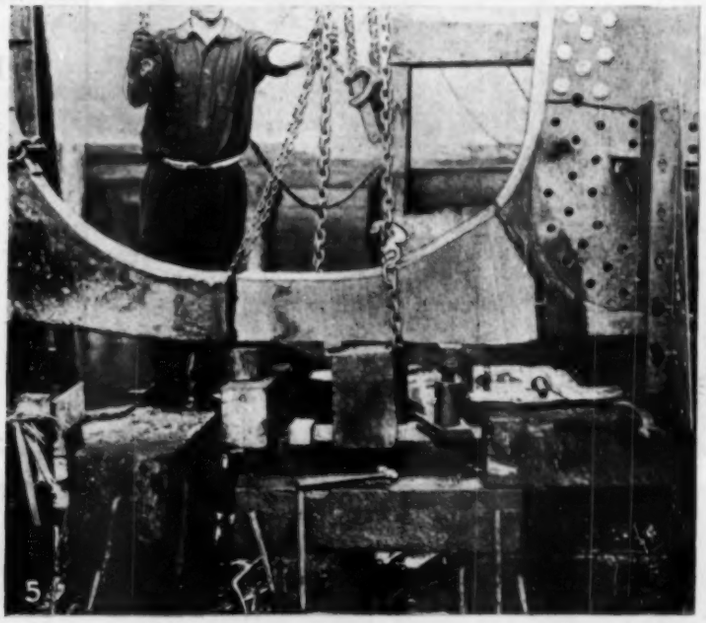
a Mechanical Whale

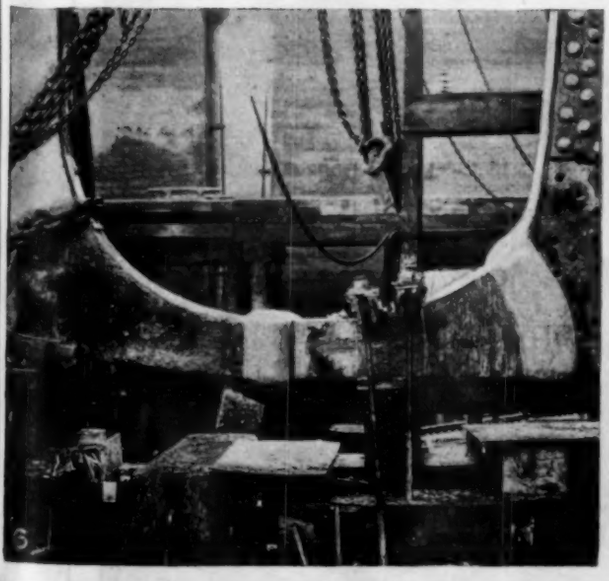
Fig. 5—The new forging in place

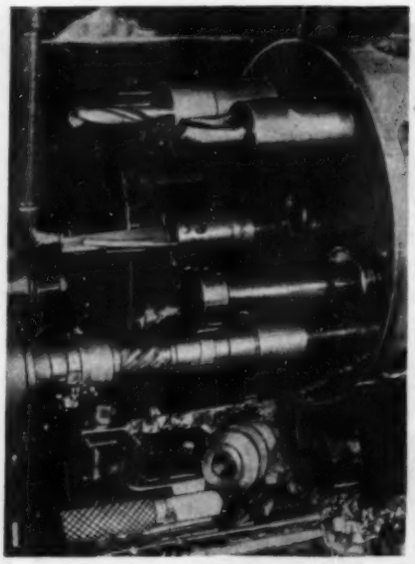
Fig. 6—Wax patterns in place. They are enclosed in molding sand and melted out during pre-heating

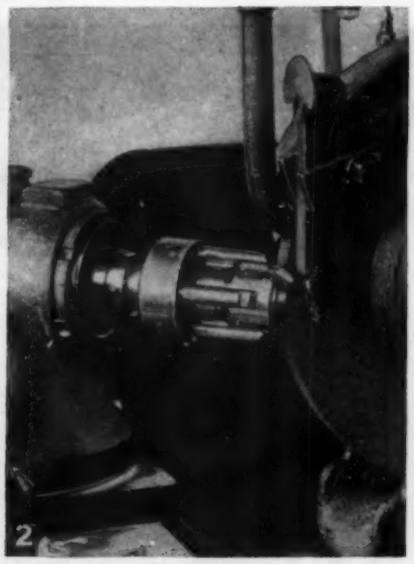
Fig. 7—The finished job

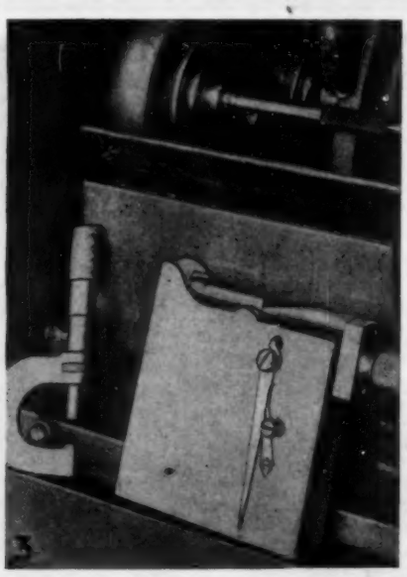
Photographs by courtesy of the Metal & Thermit Corp.

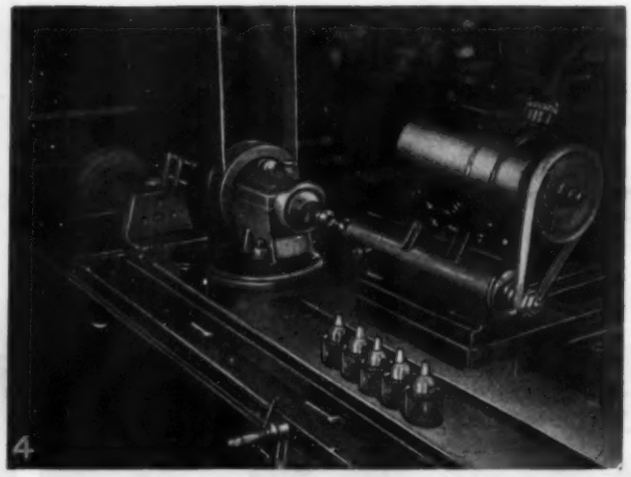












Drill Chucks in the Making

Fig. 1—Tooling for the bodies

Fig. 2—Grinding the bevel

Fig. 3—Grinding and gaging hardened jaws

Fig. 4—Final grinding and testing

Fig. 5—Testing accuracy of jaw holes

Photographs by courtesy of The Jacobs Mfg. Co.

Development of Machine Tools in New England

By Guy Hubbard

The twenty-first article—Invention of the Gridley automatic turret-lathe — Machines for turning pistons and eccentric piston-rings — A Gridley automatic of the vertical type

GEORGE OTIS GRIDLEY, whose portrait is shown in Fig. 147, was a descendant of Yankee mechanics. He was born in 1869, on a farm in the country township of Harwinton, Conn., and received his education in the district schools of the neighborhood. He spent his early life on the farm and then went to work in the factory of the Waterbury Button Co. where he became interested in mechanical work in spite of the pay—which was seven cents an hour. Not long afterward Mr. Gridley became acquainted with James Hartness and accepted an offer from him to enter the Jones & Lamson shop as an apprentice.

Fig. 147—George Otis Gridley

Later Mr. Gridley became acquainted with Christopher M. Spencer, who was at that time inventing and building the Spencer double-end automatic at Windsor Locks, Conn., and by his advice and suggestion began work upon the design of an improved automatic of his own, the building of which he took up in 1888, with the Windsor Machine Co. His proposition was that he should become its superintendent and selling agent, on either a salary or commission basis, his object being to get located in a shop where his automatic might eventually be built. Mr. Gridley's proposition was accepted and he was hired at a salary of $50 per month. He seems to have given immediate satisfaction, for within three months his salary was increased to $75 per month. He found that a great many sizes and kinds of machines, including gunstock lathes, one of which is shown in Fig. 148, were being manufactured by the Windsor Machine Co. He sought to learn from the trade just what was most desired in turret lathe design and size. New ideas, which he picked up in this way, resulted in the development of a line of turret lathes of which Fig. 149 is an example.

In the meantime Mr. Gridley was hard at work upon a single-spindle automatic turret lathe, the basic idea of which was an entirely new form of turret, inherently rigid because it was integral with a massive pin passing through the headstock, and was thus suited to the rigid support of an entirely new class of cutting tools, which were closely held upon solidly supported, individual slides. This machine, shown in Fig. 150, is the original 1⅛x5-in. Gridley automatic.

Shortly after this machine was built, a 1¼-in. automatic forming and cutting-off machine was designed along similar lines, except that it had a rocking forming-tool holder but no turret. From this the advantage of a rigid separate holder or slide for forming was made apparent, so it was decided to combine the two machines in one. The first attempt to do this by designing an entirely new machine, as shown in Fig. 151, resulted in a mechanical monstrosity. The machine never made a successful run, and made its exit under the sledge-hammer of the foundry gang.

The next attempt in this direction was more successful and, in 1904, resulted in the Gridley single-spindle automatic turret lathe shown in Fig. 152, which is almost exactly as we know it today. In 1907, Mr. Gridley conceived the fundamental idea of a four-spindle automatic of radically different design from any then in use. The heart of this new machine was an accurately-made spindle carrier, consisting of a pair of disks supporting equally-spaced spindles, the disks being an integral part of a heavy central shaft, parallel to the axes of the spindles. Upon the central shaft, was a simple four-faced turret or tool slide that was moved back and forth by the direct action of a cam drum below it.

The Gridley multiple, as it is generally called, illustrated in Fig. 153, has been changed but little from the original machine as shown in Fig. 154, except that a tool slide, carrying the tools upon the corners, has been substituted for the one carrying them upon the flat faces, and cross-slides have been substituted for the original pivoted forming-tool holders.

One other improvement which greatly broadened the field of the automatic, was the so-called vertical forming tool, ground after hardening. The early forming tools were made on a shaper, and after hardening were simply oilstoned and polished by hand. On account of

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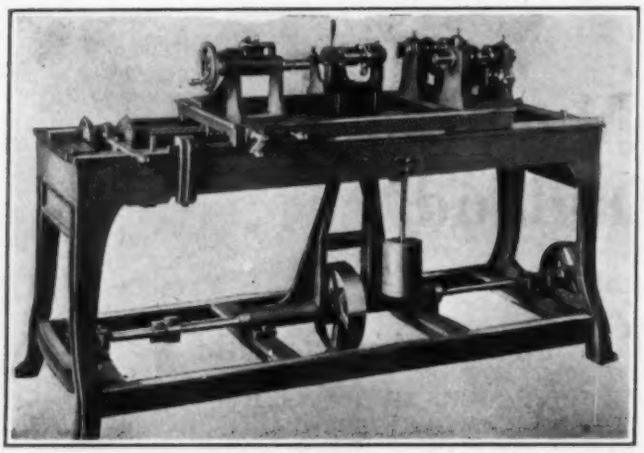


Fig. 148—Windsor gun-stock lathe (1898)

the great heat required to harden high-speed steel, they warped so much that their product used to be compared to drop forgings in accuracy. Experiments were made in grinding forming tools to exact dimensions after hardening, thus eliminating all the inaccuracies resulting from the hardening process.

On account of the 12-deg. clearance angle at which the tools are set, the form of the piece produced is not the true form of a cross-section at right angles to the tool, so in grinding, rather complicated corrections of angles and depths have to be made. A system for computing these corrections was worked out and after much experimenting, the skilled toolmakers found that they could grind to exact shape and size on a profitable manufacturing basis, the most complicated vertical forming tools. This was almost as important a step in the interchangeable system as was the original introduction of accurate gages, for a vertical forming tool on an automatic is in reality a combination of accurate gage and production tool, requiring no operator. The skill of the toolmaker is transferred to the forming tool, and the skill of the operator is transferred to the automatic lathe.

A New Type of Automatic

On one of his selling trips Mr. Gridley called at the plant of Leland & Falkner, Detroit, Mich., where at that time the engines of the early Cadillac automobiles were being built on contract. Henry M. Leland told him it was a pity that he did not make a semi-automatic machine for gas-engine pistons, as he could use several machines of this nature. Mr. Gridley said that he had such a machine in mind and showed by sketches how it was to work. Mr. Leland ordered three, but discovered that according to Mr. Gridley's specifications, two would easily handle his production. However, he said that if one of these machines could be built to turn out eccentric piston-rings he would take the three, so Mr. Gridley described and sketched the attachments that would do this. What Mr. Gridley had actually done was to invent these machines upon the spur of the moment. He now hurried back to Windsor and rushed these suddenly inspired machines through—and they were highly successful.

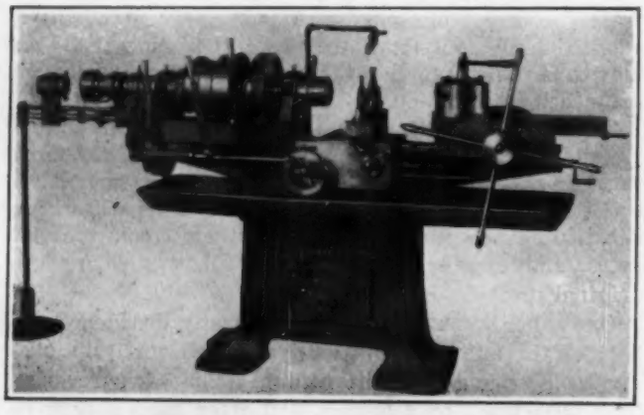


Fig. 149—Turret lathe with wire feed

Another Vermont Mechanic

Frank L. Cone was born in 1868, on a hill farm in the township of Weathersfield, Vt., not far from the birthplace of the late Charles E. Billings. Mr. Cone received his education in a district school under Justus Dartt, who had been an artillery officer in the civil war and who was a more than ordinary skillful mathematician. This training under Mr. Dart proved most useful in after years.

While Frank Cone's father was a farmer he was also a handy mechanic, and it was under him that the boy learned the rudiments of carpentry, blacksmithing and mechanics in general as practiced by the Yankee

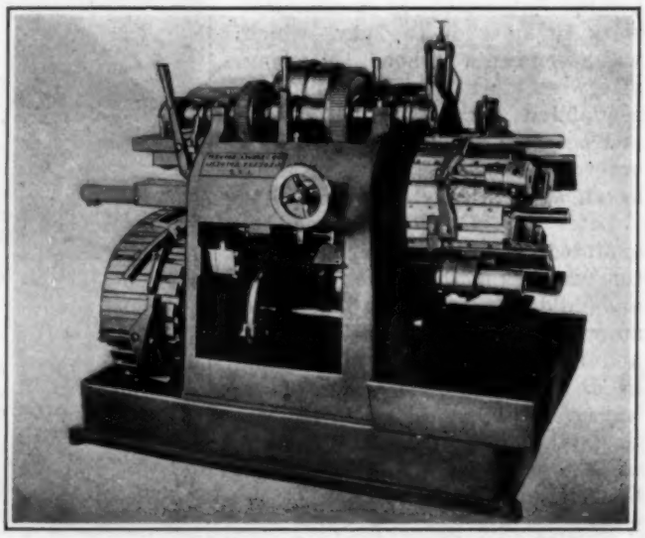


Fig. 150—The first Gridley automatic (about 1900)

farmers of half a century ago. So much was the boy attracted by such work, that he left the farm and went to work with Hira A. Beckwith, an architect and builder of Claremont, N. H., under whose instruction he became a first-class workman with ability to read drawings and to sketch plans.

For some reason the railways had a particular attraction for the country boys of those days, and Mr. Cone was not exempt. In 1891, while living on a farm near Windsor, he secured a position as general repairman in the branch shop of the Connecticut River Railroad in that town. This shop was capable of housing but one car or locomotive at a time, and was equipped with the crudest sort of mechanical equipment imaginable. One of the representative machines was an ancient planer, so decrepit that the operator frequently had to shift the belt with a broom handle at each end of the stroke. The nature of both work and equipment were such as to tax the ingenuity of a mechanic to the utmost, and Mr. Cone was able to pick up a very prac-

tical knowledge of the trades of patternmaker and machinist under two veteran mechanics in charge. In 1895 he went to work for the Windsor Machine Co. as general repairman and patternmaker. In 1905, Mr. Cone became superintendent of the Windsor Machine Co., and this position he held until 1916, when he resigned and organized the Cone Automatic Machine Co., Inc., of which he was the president and general manager. In 1917, he began the design of a multiple-spindle automatic, a four-spindle bar-working machine with the usual revolving, horizontal spindle-carrier having step by step movement in the headstock. The cam shaft and drums, instead of being in the base of

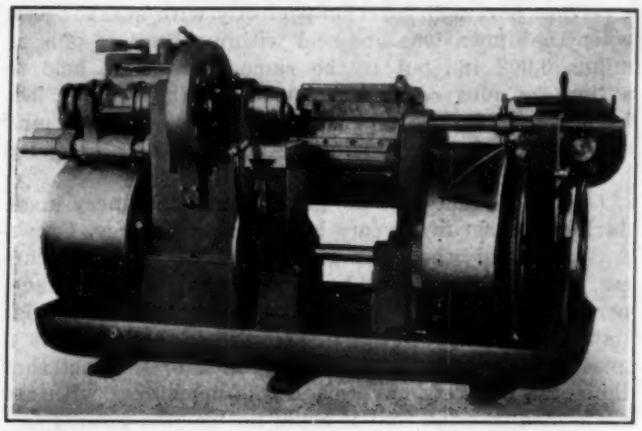


Fig. 151—An unsuccessful automatic turret lathe

the machine, were overhead. This construction kept the cams away from the chips and enabled the spindles to be placed at a height convenient for the operator, regardless of the size of the machine. Small drums were employed and the motion was transmitted from their cams to the slides, etc., by a system of multiplying levers.

The turret arrangement was carried on a table similar to the carriage of an engine lathe, sliding directly upon the bed of the machine instead of upon the axis of the spindle carrier. Independent cross-slides were placed on both front and back of the headstock to which they were gibbed at both top and bottom for rigidity.

Another mechanical development that took place under the patronage of the Windsor Machine Co. was the automatic multiple-spindle drill. This machine,

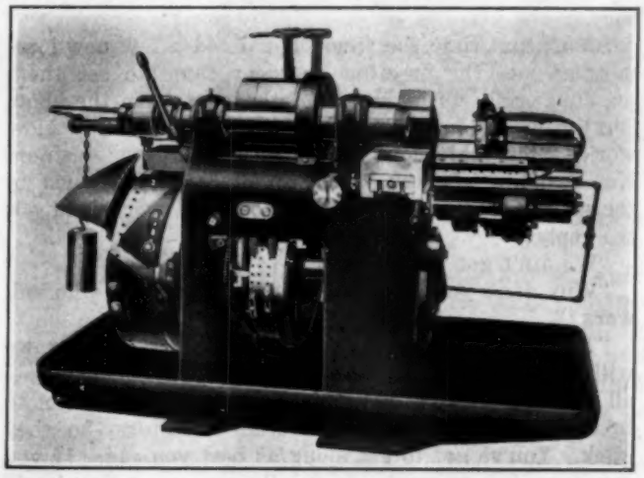


Fig. 152—Single-spindle Gridley automatic turret lathe

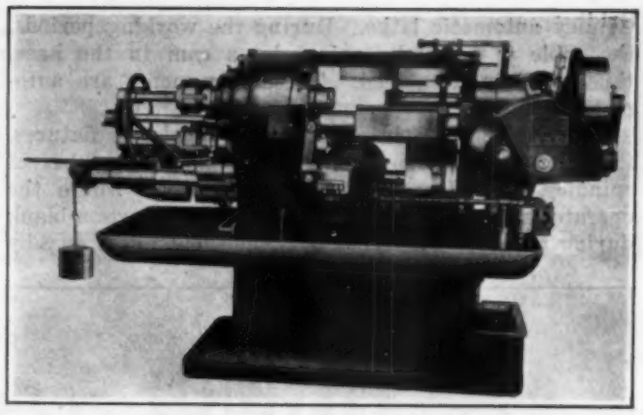


Fig. 153—Gridley multiple-spindle automatic

invented and patented by George O. Gridley in 1909, was a vertical, multiple-spindle automatic machine of the Gridley type, designed especially for drilling, reaming, counterboring, facing, turning and threading small parts.

This machine, shown in Fig. 155, has a circular base containing the driving mechanism and control cams. From the center of the base rises a massive cast-iron column, having at its lower end a bearing for the work table, and above this a thread for vertical adjustment of the spindle carrier. The spindle drive-shaft passes through the column, and at the upper end is a

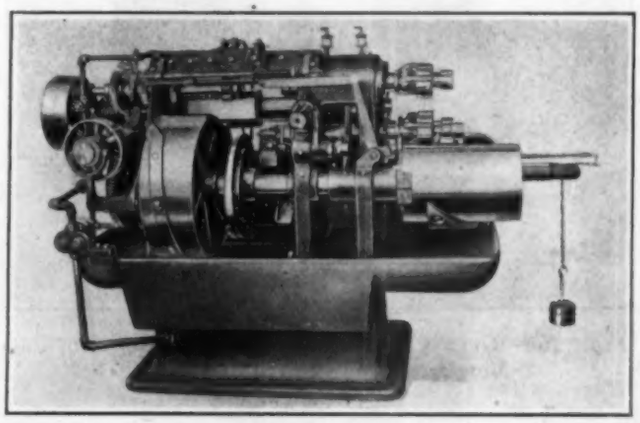


Fig. 154—The original Gridley multiple-spindle automatic (1907)—rear view

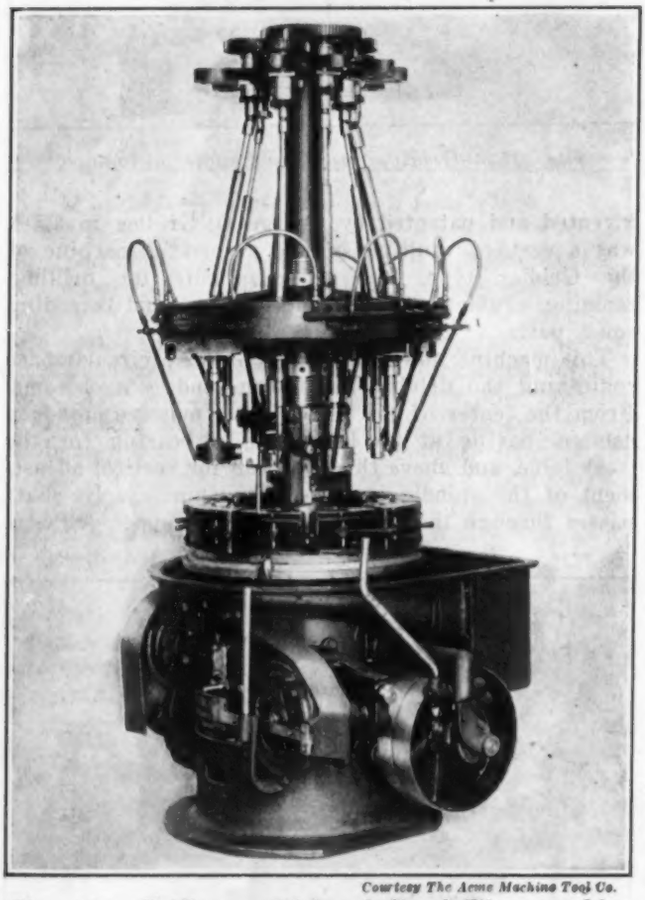
cone of three gears. Grouped about the gears is a cluster of spindle-drive gears, held in a star-shaped frame. These gears are adjustable in the frame so that they may be meshed with different steps of the cone gear to allow for changes in spindle speeds.

The number of spindles may be from five to ten, depending upon the nature of the work to be done. They are made flexible for lateral and vertical adjustment by two universal joints and a sliding coupling located between the gear cluster and the spindle carrier. The spindle carrier, in which the main or lower bearings of the spindles are located, is a ribbed circular-frame keyed to the column and adjustable up and down thereon by large spanner nuts upon the threaded section.

The circular work-table at the top of the base is revolved about the column, step by step, in a manner similar to that employed in indexing the turret of the

Gridley automatic lathe. During the working periods, the table is gradually raised by a cam in the base, thus providing the feed. These movements are automatic.

The work is held in quick-acting chucks or fixtures, the number of which is one more than the number of spindles, providing for a loading position where the operator removes the finished piece and inserts a blank during the working period. As the table moves step by



Courtesy The Acme Machine Tool Co.

Fig. 155—Gridley multiple-spindle drilling machine. Now known as the "Super-Matic"

step, the blank is brought under the different tools and the operations are performed successively, all the tools being in operation on different pieces at the same time as in the Gridley multiple-spindle screw machine. At the completion of the circuit, the blank has become a finished piece. Thus the operator removes a finished piece at the loading position every time the table indexes.

As a result of the world war, the multiple drill lay dormant until 1920, when Mr. Gridley sold the patents, drawings and patterns. Since that time its manufacture has been undertaken by the Acme Machine Tool Co., Cincinnati, Ohio, and this Windsor invention is well known to the trade as the "Super-matic."

It is a great pleasure to the writer to be able to bring this chapter to a close without having to tell of a failure or a re-organization to avoid financial disaster. The wheels of the industry do not come to a standstill here—rather their hum is about to be greatly augmented, and the chapter ends in the midst of success instead of in the shadow of business depression.

Unnecessary Precision—Discussion

BY WILLIAM L. WEBSTER

I have read with great interest the article under the above title by B. H. Blood, published on page 659, Vol. 60, of the *American Machinist*, and it would seem to me that there is one important factor in ethics of manufacturing, as well as in the cost of maintaining accuracy of product, that is not touched upon by Mr. Blood; and that is the life and service of the article after it is in the hands of the consumer.

This is, perhaps, more especially applicable to reproducing machinery—machine tools. It may well be that a certain part will function perfectly with another part when the dimensions are held within a limit of plus or minus 0.002 in., but if the same parts were held to a limit of plus or minus 0.0005 in. they might last much longer before replacement became necessary and still function satisfactorily throughout their extended life.

Is it not a fact that the magnificent machinery made during the last fifty years by Pratt & Whitney, Brown & Sharpe and other high-grade machinery manufacturers, has its reputation based upon extreme accuracy, perfect fits and the best of wearing surfaces; and that its extreme longevity and maintained accuracy at a minimum of upkeep expense, are due to the fact that the manufacturers have made this machinery with the basic idea in mind that it could not be "too good"?

I think the difference between "cheap" and expensive machinery is more a matter of accuracy than of any other one thing. We can all make mediocre goods, but few of us can make "high-class" goods.

Trying to Get Fired

BY D. B. WEDGE

The railroad-shop man has been handicapped by traditions and he has had much to overcome and live down. And a lot of it wasn't his own fault at all, but depended on circumstances over which he had no control.

I remember one case which, while not typical, actually happened, years ago, and shows how the financial management may affect things way down the line. A little jerk-water line was built to compete with the Erie, and hauled milk into New York from some of the surrounding dairy farms. As a result of financial squeezing the aforesaid road was busted and a receiver was on the job.

About that time the receiver ordered a few new locomotives and the erecting engineer came to set them up, supposedly with the aid of the men from the shop. But he soon found that the men were not only slow workers but loafed on the job in a scandalous fashion. Not realizing the true state of affairs he appealed to the master mechanic for men who would work, and got the reply:

"We ain't got 'em."

"Why don't you fire these men and get some who will work?"

"That's what these men are loafing for—hoping we will. If we fire 'em we've got to pay 'em real money—all we owe 'em. If they quit themselves they've got to take their chances with the other creditors—so they stick. You've got to get along as best you can. If you can coax 'em to work, do it. But we can't fire 'em!"

Automotive Production

The Modern Plant as a Production Machine

By E. H. Nenning
Plant Engineering Department, Olds Motor Works

Use of conveyors in the production of Oldsmobiles—Relation of plant layout to production—Construction of conveyors equipped with speed reducers and transmissions

THE co-ordination of machining, assembling and material-handling operations so that the entire plant, from a production standpoint, will resemble a huge automatic machine, is the aim of the modern production engineer. The successful operation of a modern manufacturing plant depends very largely upon two items—the layout of the plant and the efficiency of the material-handling system. Upon these two items rests the responsibility for the elimination of waste storage space, the reduction of inventory, and the ability to produce a definite amount of product in a given length of time.

Fig. 1—Roller conveyors in cylinder block department

In the motor plant of the Olds Motor Works, where the motors for the Oldsmobile Six are made, the machine shop and assembly department are practically one. The assembly line, a conveyor 500 ft. long, built by the Palmer Bee Co., Detroit, traverses the length of one side of the building, while the machines are arranged in rows across the room at right angles to the assembly so that the parts start at one side of the room and finish at the other where they will be needed. The cylinder block is machined at the lower end of the motor plant, being passed from one operation to the next on the roller conveyor shown in Fig. 1. As each block leaves the department, it passes to one of the two lines shown in Fig. 2. The line is doubled here because the valve-seating operations are slower than the following operations, requiring two lines of conveyors to keep the production up to requirements. The valves are put in the motor block and the block is passed along, receiving other parts as it progresses to the various operators. The shop is so laid out that the parts travel across the shop in the process of machining, the location of each line of machines being determined by the point at which the part produced will be needed in the motor assembly line. An example of this system is shown in Fig. 3. The cylinder heads are started from the opposite side of the room, being passed along on the roller conveyor from one machine to the next and finish, ready for use, on the side next to the assembly line. The curve in the conveyor line here shown allows the parts to pass within reach of the user at the exact

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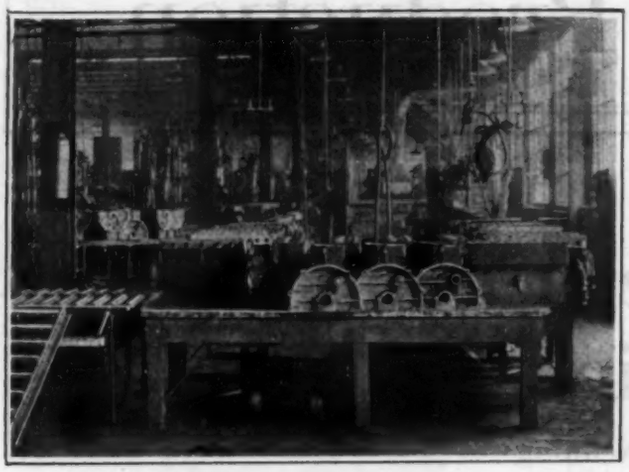

Fig. 2—Double line for slow operations

point where they are to be used by the assemblers.

After the timing gears are assembled to the cylinder block, the blocks are put onto the motor assembly conveyor which consists of a series of wooden trays carried on flanged wheels that run on a double track, as shown in the illustrations, Figs. 4 and 5. The trays are five feet apart and are attached to a heavy chain, driven by an electric motor. The desired speed of this line is obtained by the use of a speed reducer, as shown in Fig. 5. The reducer is a Palmer Bee No. 244-B, with a ratio of 90-1. A Reeves transmission makes it possible to vary the speed of the conveyor to suit conditions, a maximum speed of 7½ ft. per min., and a minimum of 1⅞ ft. per min. being obtainable. At these speeds a maximum of 89 motors per hr., or a minimum of 22 motors per hr. can be produced.

The manner in which tools are arranged so that the necessary operations can be performed while the conveyor is in operation is illustrated by the use of the electrically-driven wrench shown in Fig. 4. The tool is attached to an arm that rides on rollers in the support by which it is attached to the vertical column, and is prevented from sliding out of the support by a spring attached to an overhead beam. The arm can be swung in any direction and has a range sufficient to allow a cylinder head to be bolted down before the motor passes out of reach. The tool is known as the "Elec-Drive"

Fig. 3—Conveyor in machining department

and is marketed by the Elecdrive Manufacturing Co., Syracuse, N. Y.

As the completed motors near the end of the assembly line, they are removed and the trays then pass to an under-track, as shown in Fig. 5, and back to the starting point. An eyebolt screwed into one of the spark-plug holes permits the motor to be picked up by a hook attached to a "Little David" 1,000-lb. hoist, shown in Fig. 6. From this hoist the motor is transferred to one of a number of hooks that travel on a monorail

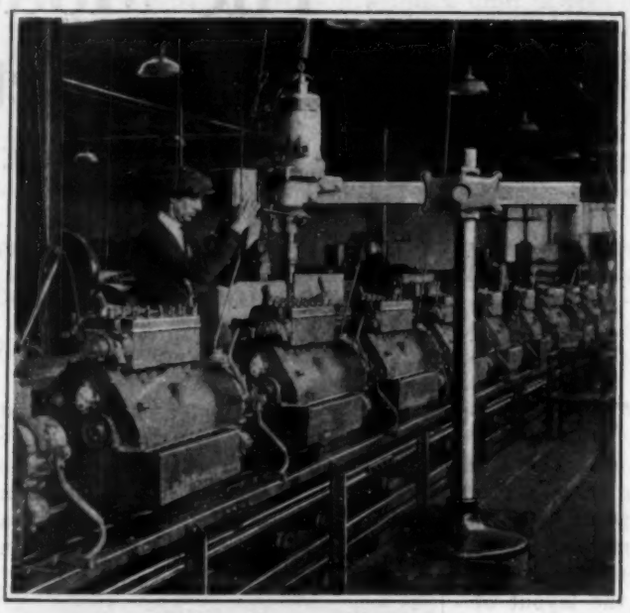

Fig. 4—Electric wrench in motor assembly line

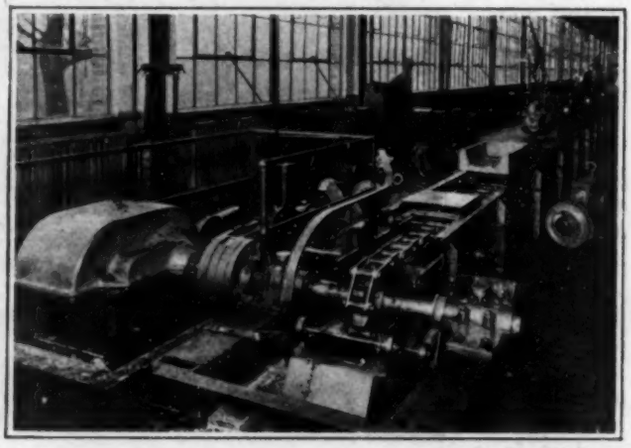

Fig. 5—Transmission and speed reducer on conveyor

connected by means of a switch to two monorails that extend the lengh of the motor test department, Fig. 7. The motors are lifted on and off the stands with the aid of one of the two air-hoists suspended from overhead tracks, as shown. After the motor has been properly tested and adjusted, it is lifted off the block and passed out through an opening in the opposite wall and placed on the trailer shown in Fig. 8, whence it is transported to the final assembly building.

Upon arriving at the final assembly building, the

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trailer is passed under a monorail that extends out through the side of the building as shown in Fig. 9. An electric hoist on the monorail is used to lift the motor off the truck and it is then transferred again to a hook on a monorail line by which it is passed to the proper position for dropping into the chassis. The monorail in this instance also serves as a storage so that an extra supply of motors is always available where needed.

The axle assembly departments, Figs. 10 and 11, are adjacent to the final assembly, and operate upon the same system as the motor assembly department, using Palmer Bee power conveyors. Each rear axle is gripped in a vise that is especially constructed to fit the work. The vise is bolted to a plate that rides on flanged wheels on a track and is attached to the conveyor chain. The front axles rest in blocks that are cut to fit, as shown. The holding devices for both front and rear axles are four feet apart. Stock bins are attached to the stationary portion of the conveyor structure on both sides to facilitate the operations. The completed rear axles are removed from the conveyor by means of an air-hoist and transferred to a hook on a monorail line by which they are passed to the proper place at the final assembly line. The front axles are allowed to slide off on a rack from which they are removed as needed. A Reeves transmission makes it possible to change the speed of each of these conveyors so that the production can be varied from 20 to 80 axles per hour.

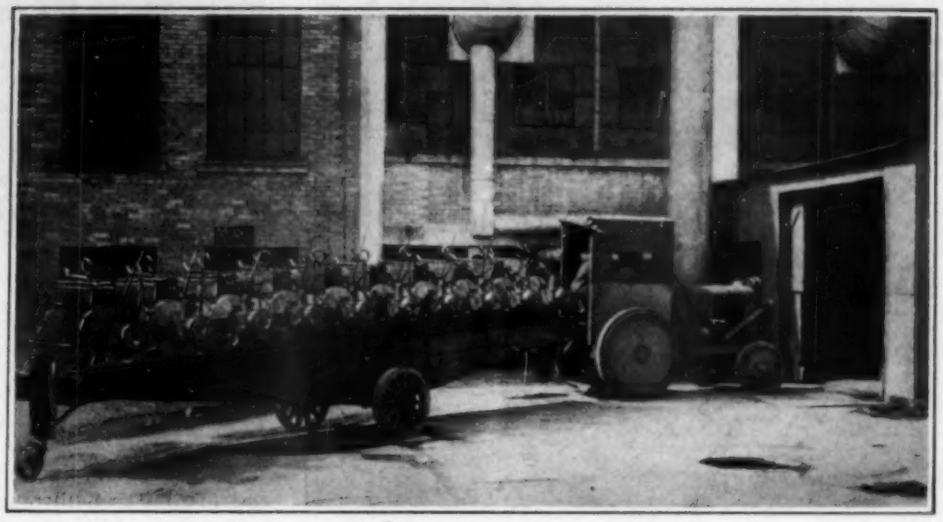

Fig. 8—Conveying motors to car assembly

The front and rear axles, motor and steering gear are assembled to the frame as it is carried along on the conveyor shown in Fig. 12, which also carries the chassis through the spray booth and enameling ovens and into the final assembly department. This is a Palmer Bee conveyor with a Reeves transmission and a Palmer Bee speed reducer, No. 164-B, having a ratio of 137 to 1. The speed can be varied from 2⅞ ft. per min. to 11½ ft. per min., delivering from 12 cars to 49 cars per hr. The carriers upon which the chassis rest are spaced so that the chassis are 14 ft. apart. After the chassis emerge from the enameling ovens, the steering wheels, radiators, wheels and tires and other chassis parts that would not stand the heat of the enameling ovens are put on and the chassis are then run off the end of the conveyor into the final assembly department where they receive the bodies and other parts to complete the car. In the final assembly depart-

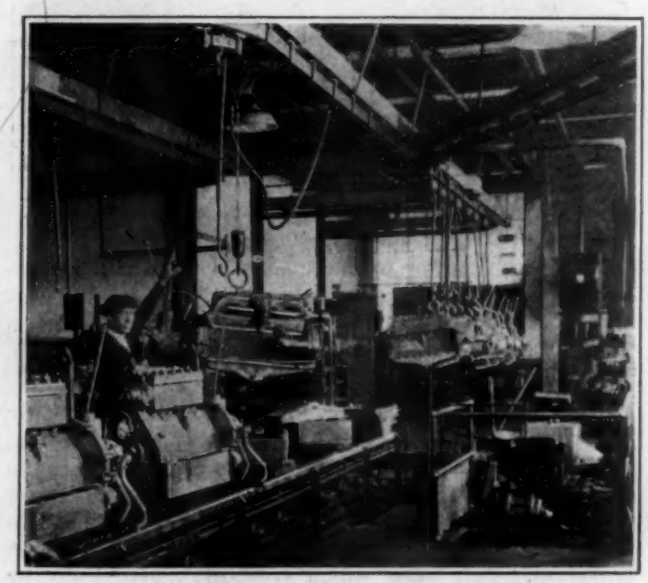

Fig. 6—Transferring motor to monorail

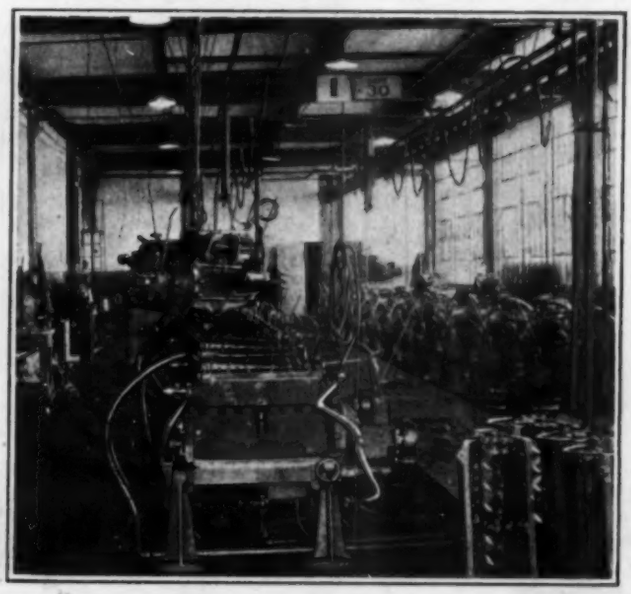

Fig. 7—Monorails and air-hoists in motor test department

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ment the chassis travel on their own wheels, being propelled by two parallel conveyors that grip the front axles. These conveyors were built by the Cecil R. Lambert Co., Detroit, Michigan.

In the body department the bodies are assembled on

Fig. 9—An electric hoist on a monorail brings the motors in

a conveyor that consists of a continuous strand of No. 131 combination chain to which are attached 32 jigs at 11-ft. intervals. A Reeves variable-speed transmission makes it possible to vary the production from 12 to 48 bodies per hour at a chain speed of from 2¼ to 9 ft. per hour. The bodies then pass to the enameling department where six parallel lines of conveyors, each 270 feet long, carry the bodies through the enameling ovens. Here, as elsewhere, Reeves variable speed transmissions make it possible to control the speed according to requirements. The bodies are then placed on a body transfer conveyor that carries them from the ground floor up an incline, across a street and into the second floor of the final assembly building where they are placed on trim-

Fig. 10—Rear axle assembly department

Fig. 11—Front axle assembly department

ming department conveyors consisting of two parallel lines of No. 131 combination chain with pusher dogs spaced every 11 feet, pushing trucks that carry the bodies.

From the trim lines the bodies pass to a Sprague hoist and are lowered through an opening in the floor, each being dropped into place as the chassis is conveyed under it. At the end of the final assembly lines, after water and gasoline have been supplied, an automatic starter starts the motor and the finished car is driven away

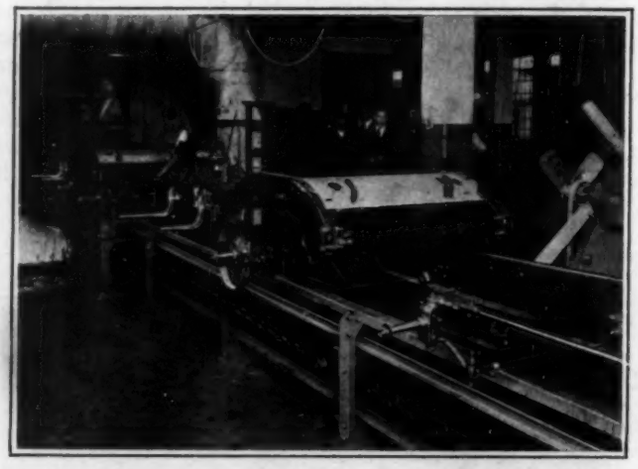

Fig. 12—Conveying chassis through enameling ovens

under its own power to the final inspection and test departments. Conveyors are also used in the wheel paint and sport model departments and for conveying wheels to their respective places in the assembly line.

Many managers are beginning to realize that only the plants equipped with the latest productive machinery and most economical methods can survive in the competition which is now facing them. It is not enough to build a *good* product, for it is difficult to find a car today which will not give good value in transportation. Only those which are built economically by the most modern machinery can hope to live.

AUTOMOTIVE PRODUCTION

High-Production Machines in the Automobile Shop

The second article of a series concerning special, high-production machines used in the automobile industry

The "M.-G. Production Unit"

IN ALL probability nothing has had so great an influence on the design of machine tools as the automotive industry. Mass production required both single and multi-purpose machines of high efficiency and designers and builders have been put on their mettle to supply the demand acceptably.

As a result, machines far beyond the dreams of designers of a decade or so ago have been developed—machines that are automatic in action and seemingly possessed of human intelligence. In the first article we described a lathe having multiple slides that were independent of each other in the matter of feed and direction.

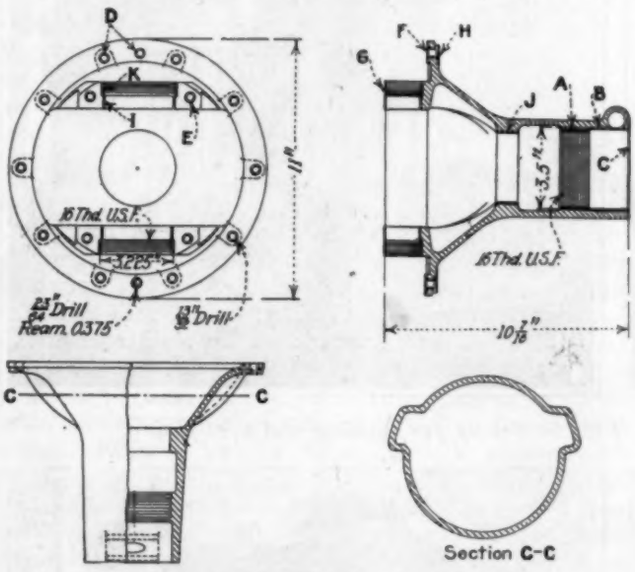

Fig. 1—Machining operations on automobile differential gear-carrier

In this issue is described a machine adapted to a variety of operations on any one piece of work.

This machine is the M.-G. Production Unit made by the Meldrum-Gabrielson Corporation, Syracuse, N. Y., and described on page 671, Vol. 59 of the *American Machinist*. It has two independent units and can carry any style of tool head suited to the work. Turning, boring, drilling, tapping and milling are among the operations performed. The work table is fed upward by means of cams, and the rate of feed can be varied as described. The No. 2 machine shown in the accompanying illustrations can drive a 2-in. drill through nickel steel with a feed of 0.015 in. per revolution.

A differential carrier can be seen in Fig. 1, with the operations marked on it. It is not attempted to do all of the operations on the same machine, but there are five machines in the battery handling the carrier. Suitable tool heads and work-holding fixtures are mounted on each machine so that the work can proceed with the minimum expenditure of time and labor. The operation is automatic in nearly every detail.

The first operation is done on the spindle at the left in Fig. 2. The carrier is held in an air chuck and a stabilizer steadies the top of it. The boring bar roughs the two diameters *A* and *B* and faces the end of the casting *C*, as marked on Fig. 1. Notice the flood of cutting lubricant used.

The second operation, shown at the right in Fig. 2,

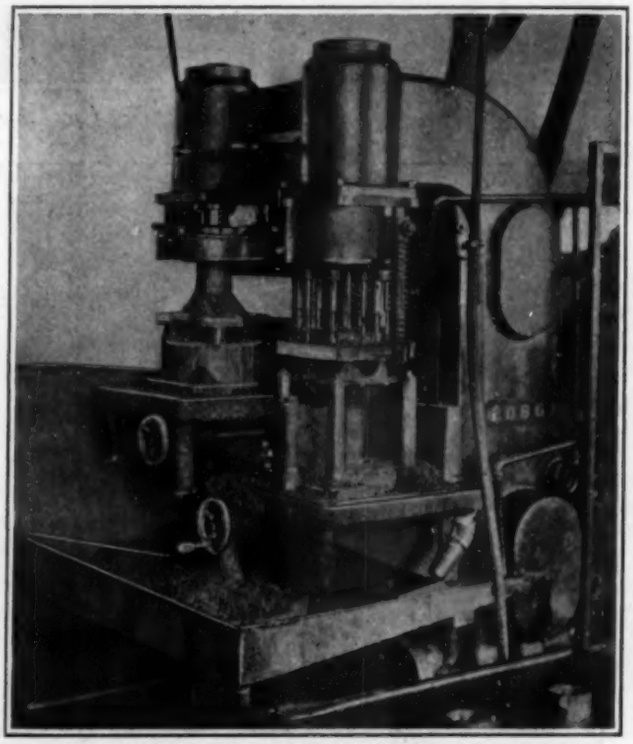

Fig. 2—Boring and drilling on unit one

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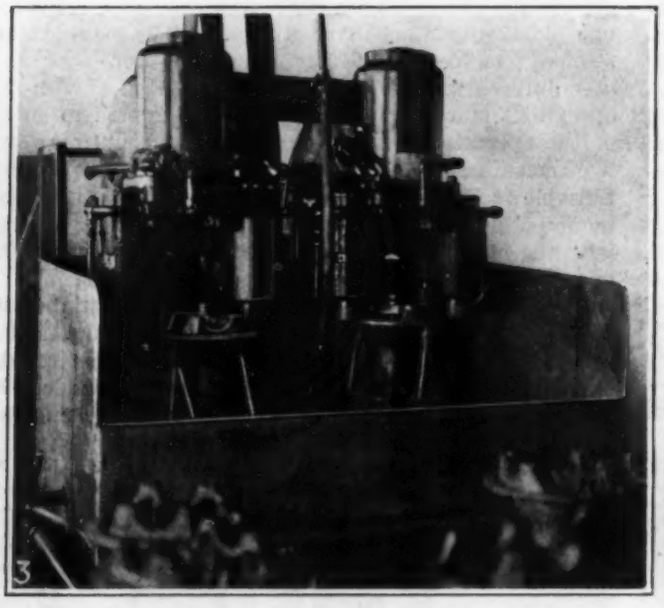
consists in drilling twelve holes *D* in the flange and four holes *E* for the caps, as indicated in Fig. 1. A special sixteen-spindle drilling head is mounted in the tool position. The work is held with the large end up, in a fixture that can be swung outward to aid in loading. The bushing plate rests directly on the work and springs serve to hold the work down solidly.

Unit No. 2, shown in Fig. 3, is doing the same operation under both spindles, the job being the rough and finish milling of the flange *F* and the cap seats *G*. This operation is very unusual as here performed, since a drilling machine is adapted to milling work. In this particular case the vertical feed is not employed. Each piece of work is held on a circular milling attachment rotated from the pump-pulley shaft by means of worm gearing. The hand lever at the left is used for moving the table transversely to clear the work when changing it.

There is another movement, however, consisting of a longitudinal feed for the table, obtained by means of a cam mounted in the usual position. When the machine is started, this motion causes the work to move under the two roughing cutters at the right, where it rotates one revolution and is milled on both the flange and the seat. The table then moves to the left and brings the work under the two finishing cutters, where it is rotated another revolution and completely finished. All that the operator needs to do is to place the work and start the machine.

The third unit, shown in Fig. 4, is occupied on the left with tapping the four ½-in. holes *E* for the cap. No cams are employed for feeding the table. The oper-



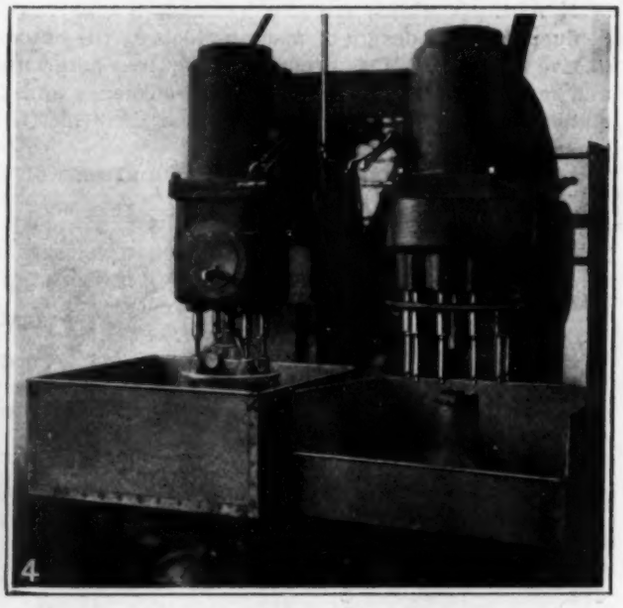
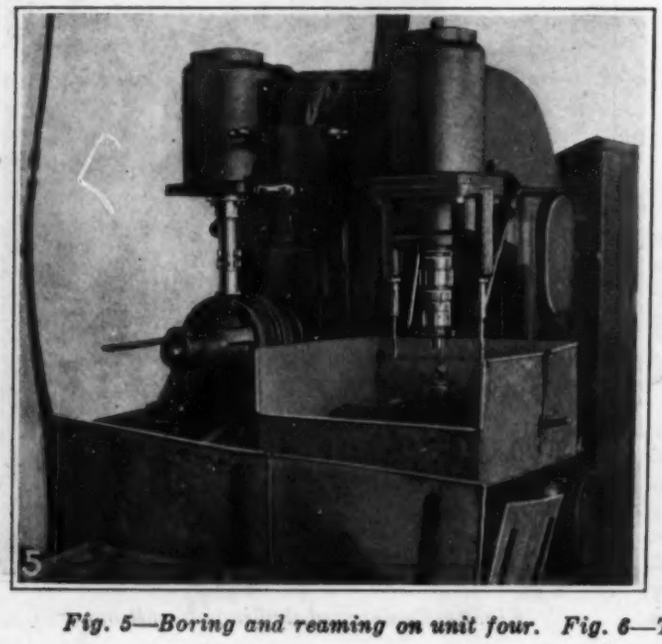


Fig. 3—How the milling work is performed. *Fig. 4—Set-up for tapping and spot-facing*



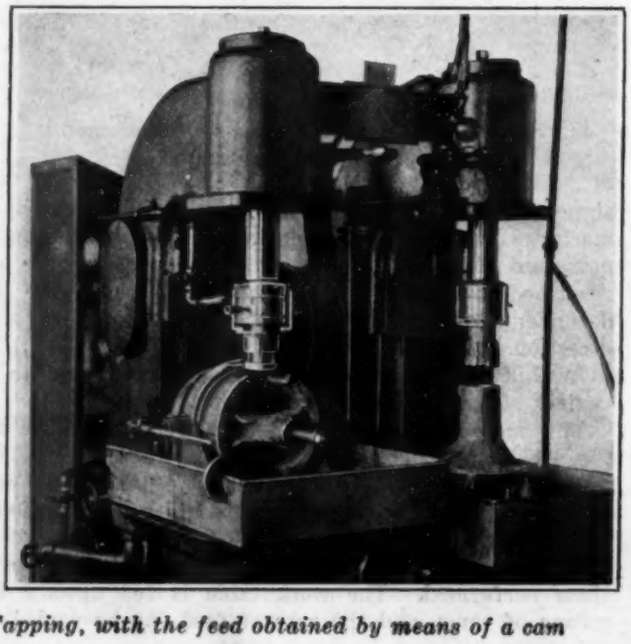


Fig. 5—Boring and reaming on unit four. *Fig. 6—Tapping, with the feed obtained by means of a cam*

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ator merely presses the lever at the front of the head, causing the spindles to feed downward and carry the taps into the work. Each spindle is mounted in a nut having the same lead as desired in the threaded hole. Operation 5 is performed at the right in Fig. 4 and consists in spot-facing the twelve faces *H* for the bolt holes *D* that were previously drilled in the flange. In this case a cam is used for the feed. Notice that the fixtures merely locate the work and do not clamp it.

The fourth unit roughs and finishes the crossbore *I*, on the column at the left in Fig. 5. In this case the caps are mounted on the carrier, which is held in an indexing fixture. Both holes are not bored at once, because of the necessity of piloting the boring bar at its lower end. The seventh operation can be seen at the right in Fig. 5; it consists of finishing the pinion bores *B* and *J* by reaming, and in reaming the two dowel holes *D*.

The last unit, shown in Fig. 6, is occupied at the left side with tapping the crossbore *K*. The work is held in a fixture that can be quickly indexed about a horizontal axis. A geometric collapsible tap is employed to tap a 3¼-in. hole with 16 threads per inch. The feed in this case is obtained by a cam, so proportioned to the speed of the tap that the correct lead is obtained without the necessity of floating the tap. The operation shown at the right of the illustration is very similar, and consists in tapping the pinion bore *A* with a 3¼-16 tap. Here again a cam is employed for the feed.

These five units, run by three operators, have effected a great economy as compared with the methods formerly employed in machining this work. The estimated time was 15 min. for the completion of a part, although the results obtained in practice are considerably better.

The flexibility of the system should be noted. One machine can be adapted to a number of operations by changing the tooling. The work may be the same on each column or progressive from one side to the other. For manufacturing, the system has a broad application not necessarily confined to the automotive field.

Production Schedules and the Life of the Automobile

By John Younger
Associate Editor, *American Machinist*

A MEETING such as the recent S. A. E. Convention at Spring Lake always brings a train of reflection in its wake. Two of the sessions stressed subjects that have to do with longer life of engines and consequently of cars. The first dealt with the crankcase oil dilution problems and the means for overcoming the evils by various devices. The second dealt with the use of air strainers to insure that the air sucked into an engine will be of the purest.

It is reasonable to assume that greatly increased life will result from concentration of thought on these evils and the subsequent action taken to lessen their effect. Engines become noisy through undue wear which in its turn happens because of inferior lubrication or because abrasive foreign matter is sucked into the engine with the intake air. Elimination of these items might easily lead to an increase of life of as much as 50 per cent. Couple with this the effect of the new "dopes" for gasoline which have demonstrated that they have a distinctly sedative effect on the explosions and you have additional factors to consider.

Changes in Design

Now let's turn to the design side for a short time. You will find that during the past year crankshafts have suddenly grown in diameter and the number of bearings per shaft has increased. Cam shafts have also been improved and forced feed lubrication is being used throughout. Similarly with the rest of the car. Transmissions and rear axles are all having their work scrutinized as never before. Four-wheel-brake problems have led to a great increase in the strength and wear resisting properties of this unit and have brought about a revamping of all the stove-bolt type of mechanism that used to be prevalent.

Let's pass on to the balloon tire, much reviled by manufacturers with stocks of wheels and rims on hand, but nevertheless an improvement which the public sat up and hollered for the minute they saw it. First of all it was said that you couldn't steer well with the new tire and so that made all the steering gear men wrestle with the problem of designing better steering gears. Practically every automotive research agency in the country is at present delving into the fundamentals of steering gear problems with a view to finding out what is the real essence of the stresses and strains to which designs are subjected. This research work will undoubtedly lead to an increase of life here.

Influence of Balloon Tires

As the pneumatic tire was to the steel tire band, so is the balloon tire to the pneumatic. At least that is the mathematical expression that visualizes the actual state of affairs. Owners are loud in their praises but the car being inarticulate cannot say how much it has been relieved from all the shocks and bounces that previously tortured its existence and shortened its life. It stands to reason that if the passenger is isolated from road shocks by some device interposed at the point of wheel contact then will the chassis in full detail likewise be protected. The influence of these new tires on the life of the car cannot at present be estimated but it must be great.

Now, all the foregoing would be of little value were the body to be forgotten in the discussion, but one of the biggest advances in automobile construction pertains to this unit. The introduction of the new enamels, particularly the pyroxylin enamels, has added tens of thousands of miles to the life of the body. Formerly the first time a new paint job was out in the rain and mud, was also about the last time that it looked new, being usually "wrecked" after one or two such treatments. With the newer finishes, however, a mud bath serves the good object of merely improving the appearance, and the body looks all the better for a rub down with a dry dust mixture. A car, like a man, is as old as it looks and if it can prolong its beauty parlor expression for a considerably lengthened

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period it is a reasonable bet that it will be much longer before it is super-annuated. Don't you think therefore that we are justified in assuming that the factories these days are building into their cars about 50 per cent more life?

Flat Rate Repair Charges

The above factors would be sufficiently important in themselves to arrest attention but just consider briefly what is happening in the realm of upkeep. For many years the public paid grudgingly the bills presented by the automobile repair man. Henry Ford led with the idea that his owners were entitled to know what a repair job was going to cost before it was undertaken and, what was more important, that they were entitled to the same degree of intelligence in maintenance work as was put into the original manufacture. This brought about the "flat rate schedule" system which in its turn has brought about a concentration of thought on the problems of the repair mechanic that is leading to greatly improved work. New tools and jigs and fixtures for repair work are being designed by the best men and the owner is being told of the fact by publicity campaigns.

Naturally the owner no longer dreads an imaginary repair bill when his car is due for its overhaul. He sends the car to his favorite shop and asks for a diagnosis which immediately tells him how much has to be deducted from his purse to meet the cost. This will make overhauls more popular and combined with the better workmanship will add still further to the life of the car.

Longer Life for Cars and Tires

All this leads up to a thought that may not seem palatable but is at the same time founded on truth. It is that the longer life of the car may have the effect of bringing about a decrease in the rate of production for a time, and will certainly bring about an increase in the available production capacity as compared with the demand. One has only to go to the tire companies for an analogy. When the cord tire was introduced it added tremendously to the life of a tire and the consequence was as we know now that rubber factories had to more or less mark time until a corresponding period of time had elapsed and demand, suspended for a time, caught up with supply.

Now cars have risen slowly in life from some five years until at present the statisticians are reckoning in terms of almost 7.5 years as the average life. In other words we will be scrapping at the end of this year the cars we built in 1918. Next year we will have the very much improved post war period cars and each year thereafter there will be still more rapidly improving cars until we reach the 1922 models which mark a big step forward. And more and more of them each year will be carried over from that 7.5-years-old period to a still riper old age, thus lessening the replacement market appreciably.

Is it not therefore the height of wisdom to study well all the figures of total production as well as the engineering elements that enter into the schedule problems before embarking on an increased production program that may lead to an overstocked inventory?

Do We Want Smooth Cylinder Walls?

By Henry C. Francis

What kind of a surface makes the best cylinder wall in an automobile or similar motor? We followed the old sapolio lapping days with the grinding machine. Now we are again lapping—or honing—sometimes after grinding but more often without.

One side claims that we need the smoothest cylinders possible to reduce friction of the rings and prevent wear on rings and cylinders. The other side claims that we do not get the real benefits of cast iron as a bearing surface, unless the pores are open so that they can hold the oil and feed it to the piston as it moves in the cylinder. They contend that we do not get a good oil seal with a dead smooth cylinder. And without the oil seal we do not get good compression.

An ardent advocate of boring cites the case of two cars of identical make and vintage. One had its cylinders rebored, the other reground. Both had new pistons and rings carefully fitted. The first has developed more power than ever before, the latter is a weak sister on hills. Of course, there is always a difference in the fit of pistons and rings but he believes both were equally good.

What makes cast iron a good bearing surface?

Is it because it has pores that hold lubricant or because it becomes glazed and prevents the oil working into the pores? We know it is a good bearing surface in either condition. In the first case, however, it must be kept well oiled to prevent cutting, while after it has assumed a "glaze" it does not cut so easily.

Of course, the condition in a motor cylinder due to the vertical position in most cases, and to the heat and the compression, are quite different from those of a plain horizontal bearing. But a little real investigation ought to do a lot of good.

A. R. A. Reports on Tires and Fuels

Tests on locomotive tires, according to the committee of the mechanical division of the A.R.A. on autogenous and electric welding, give scleroscope readings as 6.8 times the Brinell hardness, and the ultimate strength per sq.in. as 502 times the Brinell hardness. These ratios may not hold good for other metals and other conditions.

A report submitted to the annual convention of the mechanical division of the A.R.A. gives some interesting figures as to the comparative value of oil and coal as fuel. One statement, covering 45 roads and 6,133 locomotives gives from 122 to 193 gal. as equivalent to one ton of coal, The average is 159.13 gal. Another set of figures gives a range of from 97.4 to 354 gal. as equivalent to one ton of coal, but the average is almost identical, being 164 gal. for the eastern, 168 for the southern and 159 for the western district. The total average is 160 gallons.

The above data on oil fuel is particularly timely in view of the interest being shown by many manufacturers and householders in the installation of oil burners under their boilers. It will be noted that it takes more oil to equal a ton of coal than some of the oil burner men tell us.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

Difficulties in Making Tapered Shells—Discussion

BY HERMAN OSSWALD

On page 583, Vol. 60 of the *American Machinist* there appeared an article under the title given above, and which entered more or less into the technical phases of the work. Perhaps the experience we have had along similar lines may be of interest and value to the readers of your publication. Our method of solving the problem is quite different from that described in the article above mentioned, and we feel that we overcame more easily the difficulties involved.

The problem of our customer was to produce a cone-shaped cup 2⅝ in. high by 1 in. in diameter at the bottom and 3⅛ in. at the top. The material was german silver, 0.035 in. thick, and the shape was produced in five operations. The first operation, a double one, was performed in a combination die of the standard type, which cut a blank 5⅞ in. in diameter and drew it to the form shown at *A* in the accompanying illustration. At this stage the cup is 2¼ in. in diameter for a distance of 1 in. from the bottom, and tapers from thence to a diameter of 3 in. at the top.

The second operation was performed by a single-action reducing die, also of standard type. This reduction brought the cup down to 1¾ in. diameter at the bottom, which diameter was maintained to a height of 1 in., and from thence the shell tapered for a distance of 1¼ in. to a diameter of 3 in. at the top, as shown at *B*. The third operation, resulting in the shell shown at *C*, was performed in a die of similar type, reducing the diameter to 1 in. at the bottom and tapering the shell to a depth of 2⅜ in. without materially changing the diameter at the top.

It will be noted that the shells *A*, *B* and *C* each show a flange at the top. The purpose of this flange was to so strengthen the edge of the cup that it would not become distorted in drawing, and also to leave an edge that could be trimmed in a punch and die operation. The flange was 3⅛ in. outside diameter and was trimmed off, leaving the shell with a true edge and with a diameter of 3⅛ in. at the top (not shown).

Successive operations on tapered shell

It was desired that the finished cup should be square across the bottom as at *D* in the illustration, and this result was secured in a fifth operation which was performed with a 125-lb. hand-power drop hammer. The action of this was to swage the bottom to the desired square shape and to straighten out the flange left from the previous operations.

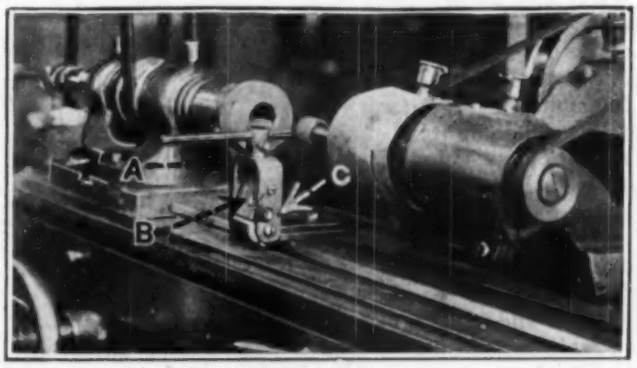
You will note that we produced this shell without resorting to any defined stepping off of dimensions as was described in the article referred to. There was a radius of approximately ⅛ in. on the punches and dies used in the first three operations, this rounding off of the corners permitting the metal to flow and avoid sharp recesses or wrinkles in the sheet.

The press operations were all performed on a standard V. & O. inclinable press with long stroke. The shell was produced without any annealing whatever between operations.

Quick-Acting Wheel-Truing Device

BY J. C. BRIGGS

A wheel-truing device that can be instantly adjusted for action or as quickly removed and which was designed for use in the plant of the Denver Rock Drill Co., is shown in the illustration herewith. The diamond holder is held in the end of the yoke *A*, which is pivotally



Quick-acting wheel-truing device in position

mounted on a base attached to the machine-table. The lock *B* is pivoted on cone-point screws and is pulled down into place against the side of the yoke by the action of a coil spring attached to the lock and to the side of the yoke at *C*. The lock seats against the upturned end of the base and holds the yoke firmly against a stop on the base. The stop does not show in the illustration. Raising the lock allows the yoke to drop back out of the way but when it is desired to dress the wheel, the single action of swinging the yoke up against the stop brings the diamond into position and locks it there.

Generating a Conical Spiral in a Lathe—Discussion

By James Pearman
Hove, England

On page 183, Vol. 60, of the *American Machinist*, in an article under the title given above, Jack Williams discusses the definitions of spiral and helix and then describes a form that is a combination of the two, to which he gives no name. The name of this geometrical form is volute, called in shop parlance in England a fusee.

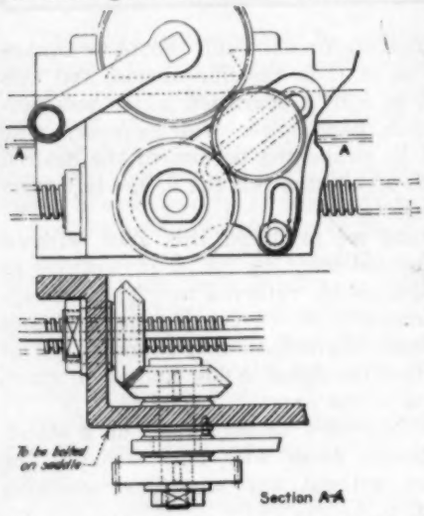


Fig. 1—Apron gearing for cutting volutes

In the British Universities Modern Dictionary a spiral is described as "A curve or curved lines receding continually from the center about which it revolves." A helix, as "A spiral line, as of a line coiled round a cylinder."

As for cutting a volute; in one shop of which I had charge we had a series of volutes to cut, varying in the ratios of helix to spiral, that is to say, some were required with fast diminishing spirals but slow helices and others *vice versa*. Also a number with about an equal ratio. The method that we adopted with complete success was to use a lathe having the cross-feed driven directly from the lead screw, which was of large proportions and splined to drive the cross-feed pinion. We made some slight alterations which allowed us to put a train of gears on the apron to drive the cross-feed as shown in Fig. 1, and with suitable trains on the lead screw we got the ratios required. Afterward, we used the same method suitably geared to turn long tapers, as the lathes were made with tailstocks without any "set over." Indeed the only "set over" one could get with the old English lathes was by slacking the headstock and adjusting it so that the axis of the spindle was at an angle with the ways, which were the flat type with dovetailed edges—an abomination to any one who has to do precision work. The adjustment was accomplished by means of two jackscrews screwed through two lugs cast on the underside of the headstock, the heads and points of the screws impinging on the sides of the gap down the center of the bed, as shown in Fig. 2. It will be seen that this adjustment could only be small when the change wheels were used, since, if the headstock were thrown out of line very much, the wheels would not mesh properly. Thanks to the influence of the American designers, all this is now changed except that the British makers will stick to the flat bed with all its drawbacks.

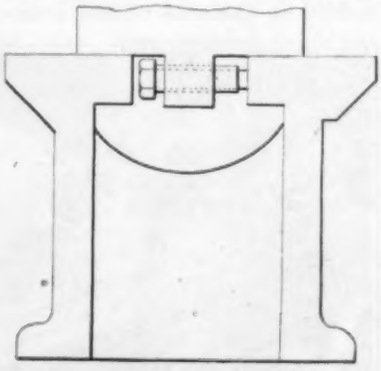


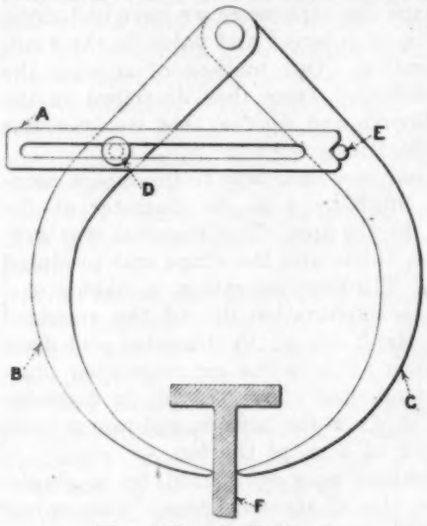
Fig. 2—Method of adjusting headstock for turning tapers

Accurate Transfer Calipers

By W. F. Sandmann

Any pair of ordinary outside calipers can be made into first-class transfer calipers by a very little work.

In the calipers illustrated, the bar *A* is made from stock about ¼x¾ in. The leg *B* is drilled and tapped for the knurled-headed screw *D*, for clamping bar *A* when set. Leg *C* is drilled for the shoulder pin *E*, which is used as a stop pin. This pin should be a press fit in the caliper leg, and project ¼ inch.



The Altered Calipers

To use the calipers, the screw *D* is loosened and the points brought against the work to be calipered. Then the bar *A* is brought tightly against the pin *C* and screw *D* tightened. The calipers can then be opened and removed from the work. It will readily be seen that if the legs are brought together until bar *A* comes against the stop pin, the distance between the points will be the same as when the work was calipered. Thus it is possible to measure the size of work calipered at a point where it is necessary to open the calipers to pass an obstruction.

Inside calipers can be arranged in much the same manner.

Soldering Zinc Die-Castings

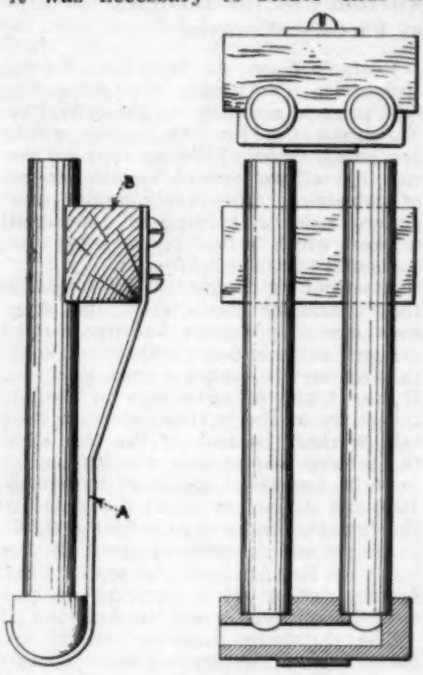
By J. P. Nikonow

Zinc alloys represent excellent material for clean and reasonably strong die castings. A typical alloy has a composition as follows, the proportions being given by percentage: Zinc 87, Tin 8, Aluminum 5, Copper 4.5. This and other similar zinc alloys do not take solder, however, as easily as brass or copper, especially when the parts to be soldered are bulky and the surfaces irregular. A slight overheating brings out a black oxide which prevents the solder from sticking to the surfaces. Soldering pastes or acids do not seem to have much effect on this black film.

The best results are usually obtained by using hydrochloric acid, which attacks zinc and forms a soldering solution *in statu nascendi* when it is most active.

At that moment the heat should be applied by a light flame or soldering iron until solder begins to melt. Excessive heating not only spoils the soldering job, but it also affects the alloy itself by rendering it brittle. The first indication of an overheated casting is the appearance of fine blisters in the form of pinheads on the surface.

A very difficult soldering job was encountered in assembling parts of a dashboard gasoline gage, in which it was necessary to solder ends of brass tubes into die-cast parts. The soldering had to be perfect since the parts must stand a test by compressed air for leaky joints. It was found that the solder did not penetrate readily into the joints, while any imperfection in soldering was extremely difficult to correct afterward. Under such conditions it was found that the best results were obtained when the soldering was done by dipping the parts in a pot with melted solder and holding them there just long enough for the joint to be thoroughly penetrated by the solder.



Part of gasoline gage and the fixture for holding it while soldering

The accompanying illustration shows the assembled U-tube of the gage and the fixture for holding it while soldering. The U-tube is formed of two brass tubes connected together by a die-cast bottom piece having a connecting channel. The bottom piece is open on one end, the opening being closed afterwards by soldering a small metal disk over it.

The holding fixture consists of an aluminum strip *A* attached to a wooden block *B*, the latter being held in the hand together with the tubes and the casting. The casting is then dipped in a pot of molten solder to a depth that will cover the joints with ¼ in. of melted metal. About five seconds of immersion is sufficient to produce a perfect joint, if the solder is not too hot.

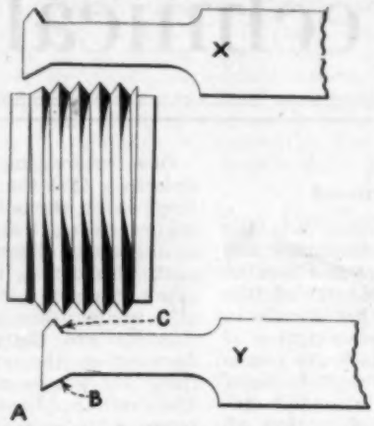
Hydrochloric acid should be used on the joints by painting the holes inside, then inserting the pipe ends, or by dipping the pipe ends in the acid and inserting them into the casting.

Saving Time with Multi-Purpose Tools

By Frank C. Hudson

The single-purpose machine has its place in large production plants but the multi-purpose cutting tool has been proved a time saver on much small work by B. C. Goldsborough, superintendent of the shop of the Pioneer Instrument Co., Brooklyn, N. Y. The accompanying illustration gives one example of the way in which he uses a single tool for turning, facing, recessing and threading.

With a tool shaped as shown and held in position *X*, the point *A* faces the front end and the flange of the work as well as turning off the outside. The angle *B* makes the recess for the thread to run into in chasing. The lathe is run backwards for these operations.



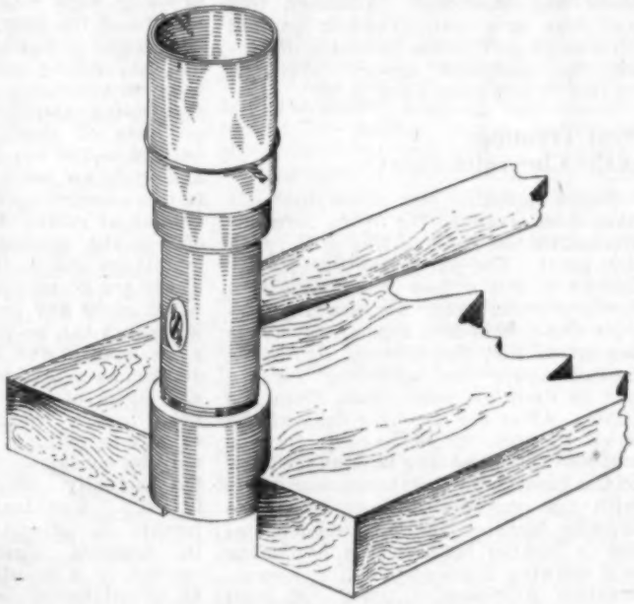
Combined turning, facing and threading tool

Running the lathe forward and bringing the tool into position *Y*, the point *C* chases the thread, so the work is done without changing the tool. This is a comparatively simple piece, but the plan works well in many other cases covering the several parts produced in this shop.

How to Make a Babbitt Hammer

By William F. Sandmann

The illustration shows a simple and cheap way to make a babbitt hammer in any shop where pipe fittings are available. A standard pipe nipple of a size and length suitable for the purpose for which the hammer is intended, is first fitted with a handle, and then a standard pipe coupling of the same nominal size is sawed in two in the middle and half the coupling screwed to each end of the nipple.



An easily made babbitt hammer

A hole is then bored in a piece of 1-in. board into which one of the half-couplings is driven about halfway through, and a piece of cardboard wrapped around the uppermost half-coupling and wired in place. The improvised mold is then set on a piece of cold iron and poured full of babbitt.

Technical Abstracts

Julius Fleischmann's Essentials of Management

It is good for us to step into the other fellow's business sometimes and see what his problems are and how he meets them. The president of the Fleischmann Co. believes that service in its broadest sense and concentration of effort are two policies which are necessarily fundamental in any business which hopes to grow in size and stability. His third essential is that all policies must be flexible and expedient.

He adds further that if you would have a thing well done do it yourself, which is the slogan of his company, and seems to fit the marketing problems. They have eliminated distribution through any form of commission agents or wholesale houses, and have built up their own organization handled by 23 district offices, which in turn have direct supervision over 960 agencies.

As indicating what Julius Fleischmann means by service, he instances the time when train service to Fort Worth was cut off by floods. It was impossible to deliver the towns' supply of yeast by usual methods and an airplane was chartered. Although this was done at a costly price it counted little compared to the necessity of giving the customer service when he wanted it.—*System*, July, p. 25.

Heat Treating at the Chevrolet Plant

Large quantity production methods have been arranged for in the furnaces erected by the McCann-Harris Corp. in this plant. The particular furnace described in this article is a combination continuous hardening and drawing furnace of a double-deck type and a unique feature is that the drawing furnace is located above the hardening furnace and is fired by waste heat from the latter. After the conveyor delivers the work through the hardening furnace and into the quenching tank at the back of the furnace an elevator synchronized with the conveyor delivers it to the drawing furnace. The combustion chamber is located between the hardening and drawing furnaces making a combination over-fired furnace for high temperature and an under-fired furnace for low heats which is regarded as the most satisfactory arrangement.

This type of furnace has three outstanding features from the standpoint of economy. The utilization of waste heat saves the fuel ordinarily required for the drawing furnace, the floor space occupied is reduced over one half with one furnace above the other and it requires only one man to operate the combined furnace unit. The furnaces are used for heat-treating rear-axle shafts and pinion shafts made from chrome nickel steel.

One interesting point about this process is that the axles are rotated as they enter the oil which is essential in preventing warping, and the work is discharged directly to the quenching tank. Hardening is done at a temperature of about 1,500 deg. and drawing at a temperature of 1,000 deg. F.

Axles are charged into the small furnace at the approximate rate of three per minute making a capacity of 180 shafts per hour. It takes about 155 minutes for a shaft to go through both furnaces, forty-five minutes hardening, seventy minutes drawing and two minutes in the quenching tank. Every tenth shaft is given the Brinell test. —*Iron Age*, July 17, p. 129.

Selling the Automobile Overseas

J. D. Mooney, Vice-Pres., General Motors Corp., describes the work of the export organization of the General Motors Corp. in selling all the products of the various factories which form the corporation to all the countries of the world outside the United States and Canada. Stating that over 17,000 such products were sold in the first three months of the year, he points out that such sales include the usual problems of every selling organization and have their own problems of crating, shipping, assembling and financing. Since the products of thirty factories have to be sold to 126 countries, more research and study are needed than in a business in this country, approximating an equal volume of sales. Many differences occur in the monetary systems, in the languages and in the railway systems. There are no magazines or newspapers which cover any two countries in which a product can be put before the public as is done in the United States. The differences extend to customs and ideals, and ideas of propriety vary a great deal, and a wording which may be exactly suited to the domestic trade may be considered not only "common" but actually offensive if translated literally. For instance, the favorite picture in advertising an automobile in America illustrates a beautiful woman in a beautiful car. But such an advertisement would have no appeal in many parts of the world where you cannot sell trucks because wives are cheaper and just as efficient! All overseas sales of General Motors cars and trucks are made through the General Motors Export Co. The work of this corporation is divided into six sales divisions: (1) Europe (2) Africa (3) Australasia (4) Far Eastern (5) South America (6) Caribbean. Offices are maintained in sixteen cities and there are distributors in 126 countries. A list of the offices and the zones covered is given in the article.—*Management and Administration*, July, p. 27.

An Index of the Incomes of Factory Workers

Prof. William A. Berridge, Brown University, Providence, was given the first prize in a contest by the J. Walter Thompson Co. for this paper which presents a series of indices showing the earnings of workers in certain groups of industries. They are compiled in a general index of earnings of industrial workers which in turn is converted into commodity purchasing power.

Attention is confined to the demand for consumers' goods alone, including such items as electric flat irons, passenger automobiles, anthracite coal, railway service, sewing machines, etc. It was found of advantage to confine the study of the buying power to factory workers because of the fact that the persons employed in manufacturing pursuits numbered nearly 13,000,000 in 1920 and the census shows that in 1919 they received more than $10,500,000,000 in wages and contributed about 28 per cent to the national income. This factory-worker group is therefore the most conspicuous group in America.

The shrinkage, however, of all incomes of all factory workers almost touched 25 per cent between 1919, the year of good business, and 1921, the year of depression.

It is shown that the maximum cyclical decline of earnings between the highest and lowest points during 1920-22 was 37.6 per cent for all factory employees.

The physical power to buy commodities depends not only upon the money, but the course of living costs also. "The Dance of the Consumer's Dollar" itself has a very important effect upon buying power and this is taken into consideration in the article.

Newspaper and magazine advertising respond very definitely to the changing course of the business cycle and charts given in this bulletin show now closely their fluctuations are related to those of the factory workers and buying index. Magazine advertising varies more nearly in harmony with our index than does newspaper advertising, though preceding it by a short interval.

In this bulletin are two other papers, one by Dr. Emma A. Winslow presenting some results of detailed studies of expenditures as a basis for an index of purchasing power. These expenditures are as shown by a family budget.

The third paper is by Richard A. Flinn of the New York State Division of Labor. He says that the ratio between the number of applicants for employment and the actual employment available in the public employment offices may be used as a comparatively simple index recording variations in purchasing power. This makes a very simple plan.—*J. Walter Thompson Co. Bulletin.*

The Production of a Lighter Chassis

W. L. Carver states that the tendency for the past two years has been in the direction of increasing weight. Brakes have been added to the front axle, the number of frame cross-members has been increased and the side channels have been made deeper generally. The average length of the wheelbase has been slightly increased, crankshafts have been made heavier, etc. For the past two years manufacturers have been concerned with absolute rather than the purely engineering economy of weight. For example, one manufacturer of frames has developed a method of forming the kick-up over the rear axle without the sacrifice of the amount of stock usually lost in the operation for frames of this type. Ordinarily, the blank is stamped from a wider strip.

In the new development the stock is but little wider than the developed length of the web and flanges of the channel at the deepest point. Before going to the forming dies, this strip is passed through a machine in which the required amount of offset for the kick-up is made by bending the stock edgewise. Similar economies have been effected by the swaging of rear axle shafts and coin-press forming of connecting rods.

The use of a high-tensile steel alloy does not help the situation as much as would be thought because the modulus of elasticity is just the same as for the poorest steel there is. Rigidity can be obtained only by a greater mass or better distribution of metal regardless of the quality of steel employed, and facts such as these are responsible for the increasing interest in tubular front axles such as Franklin has used for several years and as have been adopted by Chrysler. The Franklin Co., however, states that although its axle is 50 per cent higher in cost that the ordinary type of drop-forged axle, the latter would be at least 25 per cent heavier.

In order, therefore, to reduce weight the most important thing to be done is to start reducing the body and it is possible that may come through the adoption of the Weymann & Fabric Body Corp. types. For example, a special Ford sedan body of this type can be made 125 lb. lighter than the standard body.—*Auto. Ind.*, July 3, p. 30.

Grinding Reo Parts

Fred B. Jacobs gives good information on these processes, and takes up, for example, the surface grinding of the cylinder head which is held in a special fixture. The surface finished is an interrupted one due to a number of bosses projecting above the body of the casting. He adds that these lend themselves advantageously to finishing by grinding as they aid in keeping the wheel true and sharp, whereas the reverse is true when such surfaces are milled, the interruptions dulling the cutters. Cylinder heads are finished at the rate of one in 2¼ minutes, floor to floor time. An aloxite cylinder wheel 29½ in. diameter, 6 in. face, 2 in. rim, 141 grit, N grade, silicate bond, operating at 610 r.p.m., surfaces the job; ⅛ in. of metal being removed. Similar data are given for other operations.

Cylinder bores are finished on a Baxter-Whitney cylinder grinding machine, removing about 0.006 in. of metal, production time being 14 blocks per day.

Reo pistons are made of an aluminum alloy, roughed out by machining and finished by grinding. Difficulty is often experienced in grinding these alloys, but the wheel in this instance is filled with paraffine to keep it free cutting by preventing the metal particles from clogging the abrasive grains. About 0.007 in. metal is removed by grinding and 40 complete pistons are turned out per hour.

Piston rings are rough ground on both sides simultaneously. They are piled in a feed chute and are fed automatically one at a time from the bottom of the pile between the disks. About 0.005 in. of metal is removed from each side and the production is 35 per minute. Rings are 4¼ in. in diameter and ⅛ in. thick.

One operation described in detail is where one operator runs a LeBlond lathe which takes a roughing cut on an arbor full of rings. While this is being done, he proceeds to a Landis plain grinder and finishes the arbor full of rings that have just left the LeBlond machine. Another detail is the grinding of the back of a ring gear performed on a Blanchard rotary surface grinder. The gears are alloy steel, heat treated, 10 in. in diameter with 7-in. hole, and the production time for removing just enough metal to clean up the surface is 30 per hour. The sliding gear shaft has 2 flats, 7 in. long by ¾ in. wide. These are ground on a Wilmarth & Morman surface grinder, the work being located twice between indexing centers. About 0.01 in. of the metal is removed in 4 minutes. *Abrasive Industry*, July, p. 163.

Trade With Austria and Czechoslovakia

Attention being focussed on Czechoslovakia by the Management Congress held at Prague, this article by Samuel Crowther is of interest as presenting what may be a new light on the possibilities of the country. Austria, Hungary and Czechoslovakia, in his opinion, are scarcely worth investigating as markets in which to sell, as their buying power is not potentially great enough to make the cultivating worthwhile. They are hardly markets in which to buy other than specialties for their labor is so disorganized, their affairs are in such bad shape, and their taxes so high that the common run of their products are low in quality and high in price.

Mr. Crowther then proceeds to deal with the troubles that the salesman has to go through in obeying the laws covering passports, vises and police registration, and of course there is a tremendous amount of trouble with the customs office in getting sample goods around.

The following conditions exist, for example: Austria has a great number of spindles and comparatively few looms and Czechoslovakia has just the opposite condition. In and about Vienna are most of the cloth converters and finishers and also the clothing establishments, so yarn is spun in Austria and woven in Czechoslovakia and brought back to Austria again and made into clothing.

In Czechoslovakia, the author states, the Skoda Works, a big metal-working establishment, is owned partly in England and partly by Schneider-Creusot, which is believed to be owned or controlled by the French general staff.—*System*, July, p. 35.

Test for Zinc-Coated Materials

Zinc is used to such an extent as a protective coating for steel that any information that demonstrates its protective value is of general interest. This article by W. M. Peirce of the New Jersey Zinc Co. discusses the Preece test and explains one reason why it is not adapted for measuring the quantity of zinc coating on galvanized materials. This test is the only test specified by a large number of organizations for determining the thickness of coating. It consists in dipping the coated article into a saturated and neutral solution of copper sulphate for a certain period of time, then taking the article as a unit, removing it from the sulphate and holding it under a water tap at full pressure and noting how many such dips can be given before a firmly adherent coat of copper becomes deposited upon the steel base. The circumstances surrounding the test are somewhat vague and all that it seems to show is whether there are considerable variations of thickness or whether this is the same all over the surface.

Another factor against this test is the variation in composition among various zinc coatings of the same type. Hot galvanized coatings for example consist of several layers while the sherardized coatings exhibit a heterogeneous structure containing very little if any pure zinc and always consisting mainly of the two iron zinc alloys. Electrogalvanized coatings consist of a single layer of pure zinc.

The Preece test, therefore, does not distinguish between these various forms and gives false readings and the author draws the conclusion that it will be necessary to replace this test with some other.—*Iron Age*, July 24, p. 199.

Standardization of Cutting Tools and Fixtures

In an article by C. B. Auel, the system in use at the Westinghouse Elec. & Mfg. Co. is described. All small tools and hand tools as well as machine cutting tools are standardized to a remarkable degree. This saves money in purchasing and in storage space, and in money tied up in inventory. One feature is the ability to forge or grind down large tools to a smaller size, and so on until final smallness has been reached. This effects a great saving in scrap. This system also allows of an efficient inspection system being installed. All the tools not used during five years or otherwise obsolete are scrapped by the shop management.—*Management and Administration*, July, p. 69.

American Machinist

Established 1877

KENNETH H. CONDIT AND FRED H. COLVIN, *Editors*

Varying Work-day Reduces Unemployment

THE chief ogre of day workers has always been unemployment. The reduction, if not elimination, of the fear of being out of work goes far toward securing more contented as well as more willing workers. It also increases efficiency even though it does not do away with the necessity for constant study of methods used in doing work.

The Delaware & Hudson Railway lines have adopted a system that involves, among other things, a sliding-scale workday, varying from 8 to 10 hours, according to the work on hand. Thus if the locomotive shop is busy, it runs 10 hours, while the car shop may be running but 8. Overtime beyond the posted schedule of 8, 9 or 10 hours, as the case may be, is paid "time and a half" as usual. There is also a shop union, based on the old craft guild system of the 16th century.

While it might seem that a variation of only 2 hours in a working day could hardly take care of the fluctuations of business so as to prevent laying men off, the investigations by officers of the company indicated that this range would cover it in nearly all cases. So the 8 to 10-hr. range was selected and has worked so well that layoffs have not been necessary in the nearly two years in which it has been in operation.

The belief of a man that his job is secure does much to insure contentment and to secure loyalty. It also tends to prevent him from feeling that he might do well to look for another job, and in that way it prevents, or at least greatly reduces, labor turnover. A few other industries have worked out a somewhat similar plan but as a rule the fear of unemployment is constantly staring thousands of workers in the face. Railroads and other transportation companies are perhaps in a better position to do this than most manufacturing industries. But the plan is well worth the careful consideration of managers in all lines as it can do much to increase loyalty and so to reduce costs and make business more satisfactory to all concerned.

What Is Normal Business?

DURING the present lull of business the word "normal" is continuously used and you sense that business is far from being normal. Very few people take the trouble to define what they mean by this phrase. The condition reminds one of the state of mind of a golfer who habitually makes his eighteen holes in something equivalent to 100 plus and then suddenly finds himself one particular day making a score of say less than 90. Conditions of this day may have been perfect —the sun just right, the temperature just right, the wind just right and perhaps that elusive something present which allowed our friend to exert his best efforts and accomplish this, to him, marvelous game. A psychological change takes place in this man toward his "normal" game, he is constantly striving to repeat the performance and any further hundreds are always greeted with the statement that he is "off his game."

Business goes in that same way. The years 1918-19-20 have spoiled us for a steady grind and we are apt to think in terms of these years when we are talking about normal business and this raises the question, "What is normal business?"

Perhaps a good definition of normal business would be the average amount of business shown per year in the last ten years. If a business is established for longer than ten years, it would be interesting to plot a curve showing the ten-year average, year by year for a time, and when the trend of this year's business coupled with that of the previous nine years falls below the line of that curve, then the business is sub-normal, but if on the other hand it hits the line or is above it, everything is well.

While this statement would hold true for most businesses, there are some, notably the machine tool business, where it would not. Machine tool business has been far above the average during the last ten years because of the entirely abnormal effect of the war and the post-war inflation.

When his business progress over a period of years is analyzed by a proprietor he is much more apt to be encouraged than if he looks at one year alone, particularly if that year doesn't happen to be a "normal" one. Incidentally he will thus get a far sounder impression of actual conditions and will be less apt to make costly mistakes.

Be sure you know what your game really is before you complain about being "off it."

Politics and National Defense

PACIFISM dies hard—particularly the Bryan variety. If the amiable gentlemen who are opposing the President's Defense Day proclamation, issued according to law, had any conception of the complexity of industrial mobilization of man power, they might perhaps have thought twice before shouting.

Nobody in this country wants another war but nobody with any sense believes that it can be avoided by rendering the nation defenseless. By the same token no one without an axe to grind can fool himself or anybody else into believing that calling the country's attention to the need for defense, and the work attendant upon defense, on one day in the year, will occasion any very dangerous spirit of militarism.

Times have changed. The utter emptiness of the political orator's phrase, "A million men springing to arms in defense of their country, etc.," has been proved. And let us repeat that this is by far the easiest part of the job. That any man mentioned for public office can still hold such views is conclusive proof to us that he would be extremely dangerous if entrusted with authority, and we are inclined to believe that many thoughtful voters will be impressed similarly.

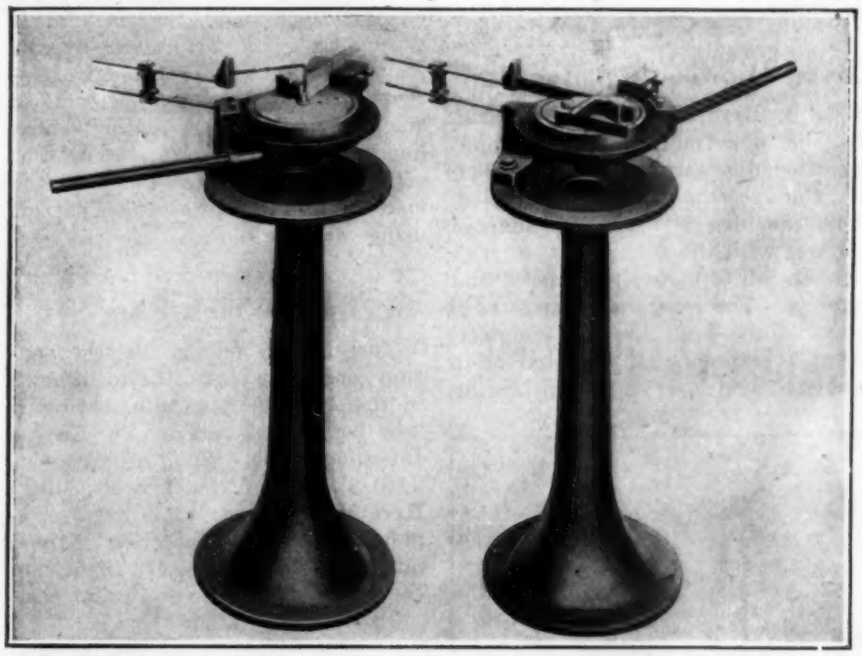
For the Foreman

THE amount of dirt on the floor of a shop is not necessarily a measure of high-pressure production. The foreman who lets castings, boxes and barrels stand in the aisles is not a bit better than the one who takes the time to haul them away personally.

Shop Equipment News

Wallace No. 10 Angle and Eye Bending Machine

A combination angle and eye bending machine that is a recent product of the Wallace Supplies Manufacturing Co., 1312 Diversey Parkway, Chicago, Ill., is shown in the accompanying illustration with two die set-ups. The machine at the left is arranged for bending small rods or flats around a forming pin, the right-hand machine being fitted for making sharp right-angle or obtuse-angle bends.



Wallace No. 10 Angle and Eye Bending Machine

The forming-pin arrangement is suitable for making a variety of radius bends, including offset or centered eyes, hinge-shaped eyes, hooks, S- and U-shapes, and angle bends with a slight radius in the corner. The stationary back die is clamped to a bracket on the outer edge of the machine and the holder for the grip-dog is near the outer edge of the rotating table, so that forming pins with a maximum diameter of 2½ in. can be accommodated. Special tool equipment for bends with a larger radius than 1¼ in. can be furnished.

In the other set-up the stationary back die is reversed and the tool holder is fitted with a rectangular die instead of the gripping blade used for bending eyes. A front "angle die" is used in place of the forming pin and is fastened to the table by means of a dowel pin and a capscrew. With this equipment the machine is adapted for making angle bends in flat, round or square stock.

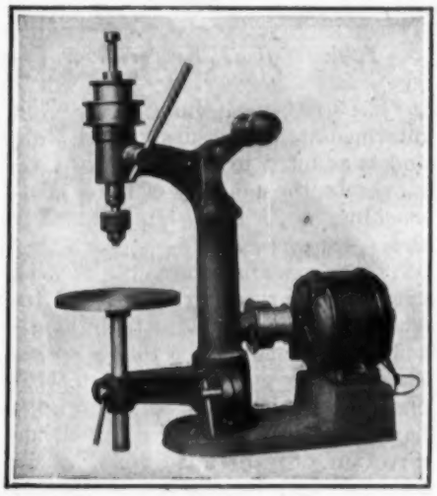
A movable gage at the left side of the machine is used for gaging the length of the stock to be bent and a stop for the handle can be clamped to the edge of the machine. The handle stop controls the angle through which the stock is bent. When the handle is pulled the rotating table with its dies is moved and the extended end of the stock is forced against the stationary back die.

Special equipment for bending light flat stock on edge can be furnished. The machine will make such bends to an inner radius equal to one-half the width of the material. The device is furnished with a pedestal as illustrated, and with one set of tools each for eye and angle bends. The machine will handle up to ⅝-in. round or square wire without heating, and ⅝x1-in. flat stock, or its equivalent. The net weight is 180 pounds.

Buffalo Improved Junior Bench Drill

The bench drill illustrated is made by the Buffalo Forge Co., 490 Broadway, Buffalo, N. Y., and is provided with a belt drive instead of a gear drive, as formerly.

Power is delivered by a ¼-hp. motor attached to the base of the machine, through a belt running over idlers. Two speeds are provided and in changing the position of the idlers in changing speeds, no tools are required, as the idler bracket is held by a snap device.



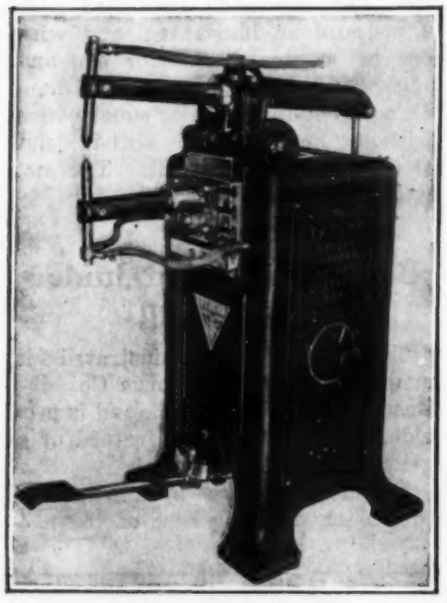
Buffalo Improved Bench Drill

The specifications are as follows:

Overall height, 27½ in. Capacity, holes up to ½ in. Drills to center of 10-in. circle. Diameter of table, 8 in. Vertical movement of spindle, 3½ in. Weight, 66 lb., crated 78 pounds.

Taylor Type N Spot Welders

A recent addition to the line of welding equipment made by the Taylor Welder Co., Warren, Ohio, consists of a series of welding machines, built in three sizes and known as the type N. These machines are built for heavy continuous duty and to withstand the hard service required for high-production operation. The small size, N-2, will weld material from 30-ga.



Taylor Type N Spot Welder

to two pieces $\frac{1}{8}$ in. thick. The intermediate size is designated N-2½ and is adapted to the welding of $\frac{3}{16}$-in. sheets, the capacity of the largest machine, N-3, being sufficient for two $\frac{3}{16}$-in. pieces.

These machines are built with overhangs varying from 6 to 30 in. The upper horn is adjustable longitudinally in and out, so that a gooseneck welding point can be used with one of the regular points. Both horns can also be revolved in either direction to permit welding in corners and similar inaccessible places. In addition, the lower horn is adjustable both vertically and horizontally in either direction.

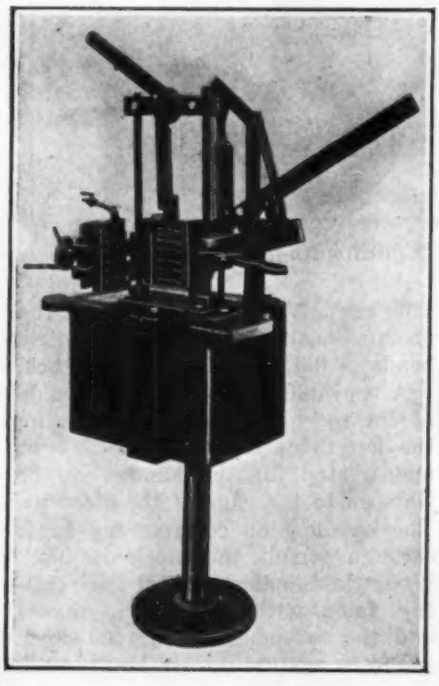
The upper and lower electrodes are water-cooled and, after passing through the electrodes, the water is conducted through the transformer so that the transformer will remain cool under continued operation and work efficiently. The three machines are furnished with 10-, 15- and 20-kw. transformers, respectively, and each has an 8-step, self-contained regulator for adjusting the current to suit the requirements of the work being done.

The switch is so designed that it cannot close until the electrodes are properly in contact with the work, and requires no adjustment for the thickness of the work or wear of the electrodes. A lever is provided for changing the action of the switch from the automatic to the non-automatic trip. The non-automatic trip is useful when welding work that is buckled and does not fit together properly, since it permits the application of pressure on the welded section after the current is turned off. The automatic trip is used when speed is desired and is adapted for use on wire work and clean sheets.

The treadle of the foot-operated machine can be adjusted in a variety of positions to suit the convenience of the operator. The machine can also be furnished with a quick-change gear box for driving by belt or motor.

Byrd Die-Casting Machine

R. E. Byrd, 318 Reed St., Erie, Pa., is now marketing the hand-operated die-casting machine shown in the accompanying illustration. This machine is especially adapted for use with the soft alloys, such as pewter, white metal, type metal and babbitt. The machine consists of a suitable gas-fired heating compartment for the metal, mounted on a pedestal and carrying the holding and closing mechanism for the dies above. Either solid, or hollow slush castings can be made with the machine. The dies are carried in a bolster that slides up and down on suitable guide rods and is moved by a toggle lever at the top of the mechanism. When the dies are closed the operation of this lever forces the opening or gate of the die against the opening in the cover plate of the metal pot. The long lever extending at the right of the machine in the illustration is then depressed, thus forcing the metal into the die through the action of a piston in a cylinder. A thermometer of suitable range is provided for the molten metal chamber and allows close regulation of the temperature of the metal.

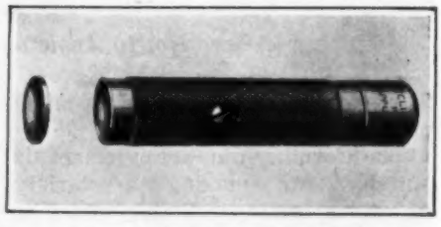


Byrd Die-Casting Machine

The die mechanism is built to suit the requirements of the job to be done and the manufacturer of the machine is prepared to furnish special die equipment for making parts on the machine. The machine is especially adapted for use by the manufacturer of products that include die-cast parts and provides a quicker and better method than hand-pouring. It is stated that small parts have been made on the machine at the rate of 1,500 per hr. using multiple dies.

Eclipse Welch Plug Set

For properly setting Welch expansion cored-hole plugs, the tool shown in the accompanying illustration is now being marketed by the Eclipse Interchangeable Counterbore Co., 7410 St. Aubin Ave., Detroit, Mach. Heretofore, the method most commonly used for the insertion of these plugs has been to insert them into the counterbored holes in the cast-



Eclipse Welch Plug Set

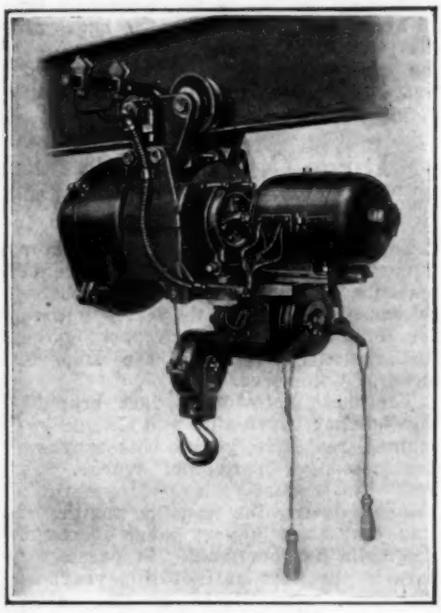
ing and then strike them with a hammer. This method produced many cracked castings and leaky joints.

By using the Eclipse plug-setting tool, the hammer cannot come in contact with the wall of the casting and the plug cannot be concaved,

because the tool is designed to indent the plug the amount recommended by the manufacturer. The shell of the tool is of machine steel and the set is of tool steel. A retaining screw is provided to prevent the separation of the two parts. Nineteen sizes of the tool are available and are adapted for plugs from ½ to 2¼ in. in diameter.

C-M Electric Hoist

A recent addition to the variety of hoisting and conveying equipment manufactured by the Chisholm-Moore Manufacturing Co., Cleveland, Ohio, is a series of electric hoists built with load capacities from 500 lb. to 5 tons. The essential parts of this hoist include a standard enclosed crane motor; a controller especially built for hoist service; two reductions, of spur gears; a Weston load brake; a winding drum; a hook block; and a mechanically-operated motor brake.



C-M Electric Hoist

A feature of the machine is the fact that all the operating parts of the mechanism can be removed after taking out six bolts, and it is unnecessary to draw any keys to disassemble the parts. The hoist is adapted for use with the standard overhead track and trolley systems manufactured by this company. For hoisting only the device may be attached to a stationary support. When both hoisting and conveying are to be done, the hoist can be carried on a hand-operated crane for small loads or a motor-driven trolley can be used for heavy loads and long-distance conveying.

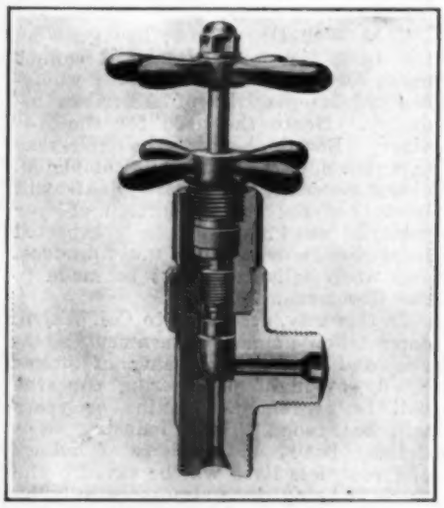
Any standard make of a.c. or d.c. hoist motor can be used, the splined end of the motor extension shaft being fitted into a flexible-disk coupling. A shoe-type brake is provided for the motor and is operated by the controller, a magnetic brake being supplied when the conditions require it. The controller is of the standard enclosed drum type. A steel trip lever, operated by contact with the hook block, limits the upward travel of the hook and the load is controlled at all times by means of a Weston load brake running in oil.

The drum is placed in the frame of the hoist in such a position that the rope cannot get outside the flanges and jam.

Oxweld Oxygen Manifold Valve

A manifold valve designed for satisfactory operation under the high pressures commonly used in oxygen tanks has recently been placed on the market by the Oxweld Acetylene Co., 30 East 42nd St., New York, N. Y. The sectional illustration shows the construction and operation details of the device.

The body of the valve has a formed seat into which the stem tip is pressed when the valve is closed. The tip is attached to the stem by means of a swivel joint, so that it is free to seat itself naturally in the body. The stem screws into the inner end of a stuffing-box that is seated on a lead gasket to provide a gas-tight joint. Leakage around the stem is prevented by rubber packing compressed between two packing rings by means of a handwheel and nut.



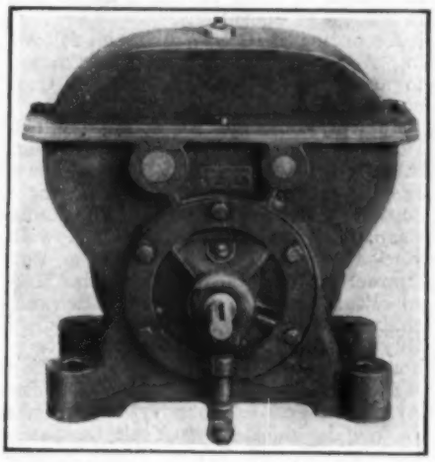
Oxweld Oxygen Manifold Valve

The valve is so designed that the internal parts will not be blown out, even if the operator should happen to unscrew the handwheel all the way, because the stem screws into the stuffing-box.

Hill Industrial-Type Spur-Gear Speed Transformer

The speed transformer shown in the accompanying illustration has been lately brought out by the Hill Clutch Machine & Foundry Co., Cleveland, Ohio, and is intended for use under continuous or heavy-service conditions.

The transformer consists of a nest of plain spur gears revolving in oil, changing the revolutions per minute of the input shaft to some desired revolutions per minute of the output shaft. The gears all have 20-deg. involute-form cut teeth, the short length of which insures great strength and reliability. Both the high- and low-speed shafts are supported in double bronze bearings, insuring strength, rigidity and quiet operation. Provision is made for ordinary thrust conditions.



Hill Industrial-Type Speed Transformer

Ease of accessibility is obtained, as the cap and both ends can be quickly removed. The oiling arrangement is a continuous and thorough splash system of lubrication, obtained by a metal disk on the high-speed shaft, which automatically lubricates all gears and bearings. The entire unit is inclosed, and is dust and leak proof.

Both high- and low-speed shafts are in identical axial alignment. The action is positive and both shafts revolve in the same direction.

News of the Week

Industrial Mobilization Will Test New Defense Plan

Gary, Schwab, Tripp and other industrialists will participate

Leaders of industry will assist the New York District Ordnance Office of the War Department in playing an industrial mobilization game which will form part of the Defense Day exercises to be held early in September. Among those who will participate are Judge E. H. Gary, Chas. M. Schwab, Gen. Guy E. Tripp, Samuel McRoberts, and other prominent manufacturers, financiers, and merchandisers. Col. James L. Walsh is chief of the District and in charge of operations.

According to Col. Walsh, the following Advisory Board has been formed to assist the New York District Ordnance Office:

John I. Downey, president, John I. Downey, Inc.; M. Friedsam, president, B. Altman & Co.; S. Parker Gilbert, Jr., Cravath, Henderson & DeGersdorf; James G. Harbord, president the Radio Corp. of America; Herbert P. Howell, vice-president, Peierls, Buhler & Co.; Samuel McRoberts, president, the Metropolitan Trust Co.; Charles M. Schwab, chairman, the Bethlehem Steel Corp.; Guy E. Tripp, chairman the Westinghouse Electric & Manufacturing Co.; William H. Woodin, president the American Car & Foundry Co.; James L. Walsh, chief, New York Ordnance District, United States War Department, member ex-officio; and E. H. Gary, chairman, U. S. Steel Corp., is chairman of the Advisory Board.

Col. Walsh Explains Purpose of the Board

"This Board has been appointed to assist the Government representatives in their endeavor to effect a reasonable degree of preparedness from an industrial standpoint in the commercial area which centers around New York," said Col. Walsh. "Under present plans it is to be a permanent organization. It will assist the District Ordnance Office in playing the industrial mobilization game directed by the War Department and which will be played during the week of Sept. 5 to Sept. 12, or just prior to the main Defense Day program. The playing of this game will be the first test of our new organization.

"If the World War demonstrated anything," Col. Walsh stated, "it was that troops could be organized and trained much more rapidly than they could be equipped with those highly complicated implements needed to give them at least an even chance against the enemy. The rate at which up-to-date arms and ammunition can be manufactured is, therefore, the controlling factor in determining the rapidity with which a nation can prepare to defend its sovereignty. It is to this vital phase of preparedness that the newly appointed Advisory Board will direct its particular attention.

Eliminating Waste

"During the World War the excessive cost of war supplies was due to two principal causes: first, excessive quantities were ordered by officers fearful of being caught short of vital supplies at critical moments; and secondly, to the advance of prices due to competition between Government agencies. To prevent a recurrence of such extravagance, the War Department has had 50 army officers working for a year in computing every possible item needed in a major emergency. This work is now done and its importance can be gained from the fact that if such careful planning had been done prior to the World War, more than $200,000,000 could have been saved in leather goods alone.

"The War Department has gone as far as it can unaided, and it cannot make further plans without the wholehearted co-operation of American industry. Hence the need for the Advisory Board. After the five-year program now mapped out is completed, every manufacturer whose plants will be needed for the production of war material will know what he is expected to provide, how much he must produce, and when deliveries must be made to the Government.

In this way, according to Col. Walsh, competition among Government agencies and the sky-rocketing of prices by fly-by-night profiteering concerns will be prevented. Months or years will be needed to put industry on a defense basis, and billions of dollars and countless lives will be saved. The work is being done almost entirely by reserve officers without pay, so that there is no burden on the taxpayers.

Judge Gary Comments on Advisory Board's Activities

Judge Gary in commenting upon the announcement of the organization of the new Advisory Board gave it as his opinion that "if the industrial preparedness work mapped out by the Advisory Board can be generally achieved within the next five years, the ordnance problem—the weak link in our defensive armor—will be solved and no nation or group of nations will dare attack us."

Machinery Is Destroyed in Old Hickory Fire

Forty-five million pounds of powder was destroyed by fire at the Old Hickory Powder plant near Nashville, Tenn., Sunday, Aug. 10. The loss, on the basis of present prices, is estimated at more than $2,000,000.

The powder was manufactured for the Federal Government during the war at a cost of approximately $22,500,000 for the 45,000,000 pounds destroyed.

Machinery and buildings erected by the Government during the war at a cost of more than $5,000,000 were destroyed by the flames, which swept over an area of forty acres in the heart of the plant. The total war-time cost of the property and powder destroyed was estimated to be more than $28,000,000.

Large Gains in Auto Exports

The first six months of 1924 show numerous changes in leading foreign markets for American automotive vehicles, compared with yearly figures for 1923, according to a report by the Automotive Division of the Department of Commerce.

The most noteworthy fact brought out is that Australia and Japan remained respectively the best markets for passenger cars and trucks. In both the export sales of American vehicles during the first six months of this year show a very large increase. Australia has bought 20,964 passenger cars in the first half of this year, as compared with 25,817 in the entire twelve months of last year. Japan has taken 3,007 trucks so far this year as against 5,111 in 1923.

Noticeable changes occurred in the position of other leading markets. In passenger cars, Argentina has risen from sixth to second place taking almost as many in six months this year (5,827) as during all of 1923 (6,645). Canada has dropped from second to third place; British South Africa has risen from tenth to fourth; Cuba, Japan, and Brazil have improved their positions in the export table.

Exports for the first six months of 1924 are far in advance of the rate set during 1923. So far this year, 80,293 passenger cars, valued at $57,466,400, have been exported from the United States, compared with 127,035, valued at $90,692,272 in all of 1923. Shipments of trucks this year number 14,572, with a value of $9,837,258 compared with 24,859, valued at $15,317,136 during the twelve months of last year.

The Part that Advertising Is Playing in England's Industries

Americans hear Mr. Churchill at international convention

By E. J. Mehren
Vice-President, the McGraw-Hill Co., Inc.

There met in London recently an international advertising convention—the largest in fact ever held by the Associated Advertising Clubs of the World. To me the importance of the meeting lay not so much in what was contributed on the mechanics of advertising as in the view of this new—or relatively new—business force taken by British business men and statesmen, heirs as they are to centuries of business tradition.

I include the British statesman as an heir to British business tradition advisedly, for British diplomacy has never been affected—some will say motived—by trade considerations. This was to be expected in a country so dependent on foreign trade. Moreover, statesmanship at home in an industrial country must envisage business and its methods for they inevitably and powerfully affect social conditions. The views of British statesmen regarding advertising, therefore, are of much importance. My expectation that the meeting would be interesting from this point of view was not disappointed.

The analyses made, moreover, are of interest to American engineers as well as to American industrial managers and business men, for while the function of distribution is in accord with the principle of division of labor, separated from production, the two are, economically, inseparably bound together. Of what use to produce, if the product cannot be sold? Of what value to reduce manufacturing cost, if all the savings are to be negatived by a wasteful distribution system?

Let it be said at once, then, that the leaders in British business and statemanship do accept advertising heartily, as a valuable ally in the distribution of goods. It was natural, too, that the speakers should often speak of advertising in its relation to foreign selling, for before the war 45 per cent of Britain's industrial production was sold abroad.

Mr. Churchill's Views

Winston Churchill brought out the function of advertising with remarkable force when he inquired into the reason for the present stagnation in European business. He pointed out that Europe's economic difficulties were due to a great decline in the "consuming power, a great fall in the purchasing power, a great decline in the demand for goods and services of every kind from man to man and nation to nation." On the other hand, he argued, the world's producing power, increased by war development and by new discovery and invention, is greater than ever and is ready to come forward at any moment that the purchasing and consuming power revives.

"Advertising," he said, "nourishes the consuming power. It creates wants, it reveals possibilities, it spurs exertion, it brings together in fertile union what would otherwise have never met.

"Advertising is not all. There must be the spirit of enterprise, there must be confidence, there must be stability, there must be good will.

"But all these conditions might exist unrelated, unconnected, unless publicity, propaganda, and advertisement were brought in to unite them and fuse them into one effective whole, to make them vital and to make them active."

Surely, if this view be true, a proper appraisal of the place of advertising in the economic scheme must be the possession not only of the business man, not only of the engineer, on whose genius the industrial structure rests, but of the citizen and sociologist concerned with social progress.

But Mr. Churchill saw in it still further functions—as a protection against profiteering by carrying to the consumer a knowledge of the value and price of goods; as an encouragement to sound competition; as a means of improving, through the cheapening of distribution.

Finally, Sir Philip Lloyd-Greame brought out the point—though in this he had been anticipated by an American, James D. Mooney, president of the General Motors Export Co.—that advertising was a powerful factor in stimulating men to work harder in order to produce and gain the means for buying goods so attractively advertised. Advertising stimulates desires, and the satisfaction of these desires brings forth men's thinking and productive powers.

Many other analyses of the functions of advertising were offered, but these will suffice to show that British students of the subject have fathomed its purpose. Whether they have, so successfully as we, used advertising is open to debate. The British freely say that our practice is ahead of theirs. But even if it is, advertising has come into its own in England and where leaders, such as those quoted—and none of them is a publisher—are relating advertising to its place in the economic and social system, its growth must be steady and sound if not unusually rapid.

On the other hand, if we are ahead of the British in advertising practice, all too many of our leaders in business, in industry, and in the professions have not viewed it fundamentally as have our British friends. Too many of us deprecate it, its functions and results.

The British are right. It is a tremendous force in our economic scheme. Its full potentialities have not been realized. Unfortunately, it has been misused. It has suffered, too, from the superficiality of advertising men. But the faults of its advocates and its use should not obscure its fundamental values—least of all to engineers, foundation stones as they are of the industrial structures.

Preparing for Large A.S.S.T. Exposition

Every year shows a remarkable increase in the activities of the A.S.S.T. The International Steel Exposition and Convention in Boston Sept. 22 to 26 will be no exception to this rule, according to members of the society. The program that has been prepared represents an unusually strong feature that will prove attractive not only to members of the A.S.S.T., but to many others interested in metal treating and metal working.

The exposition this year will be the largest ever held under the auspices of the society, being thirty per cent larger than at Pittsburgh last year which up to that time marked the highest point in the convention's activities. Last year 79,000 sq.ft. were used, while this year 150,000 sq.ft. will be necessary to accommodate all those exhibitors who are desirous of showing their products.

An interesting feature of the exhibit this year will be that of the machine tool and machine manufacturers who will have an entire section of 25,000 sq.ft. devoted exclusively to machine tools in operation.

The Boston committees under the direction of A. O. Fulton as general chairman, have been working in the preparation for various events which mean much to a successful convention.

The hotels of Boston are rapidly filling up with reservations, although there are yet a large number of accommodations available. They have expressed a wish that wherever possible group reservations be made, inasmuch as a great many of the rooms available at present are adjoining rooms with connecting bath.

There is no doubt whatever that the hotel facilities in Boston will be adequate to take care of the 8,000 visitors from out of town.

General Electric Pays Bonus to Employees

Over a million dollars in supplementary compensation was paid Aug. 4 by the General Electric Co. to those of its employees who have been with the company continually for five years or more. The bonus payments are for the six months ended June 30 last, and amount to five per cent of the earnings of the employees during that period. A total of 27,412 employees shared in this distribution, which was paid largely in bonds of the G-E Employees' Securities Corp. The total amount paid was approximately $1,172,000.

At each of the principal factories of the company payments were made as follows: Schenectady, $466,000; Lynn (River Works), $143,000; Pittsfield, $107,000; Erie, $53,000; Fort Wayne, $56,000; West Lynn, $56,000; Bloomfield, $19,000; Edison Lamp Works, $54,000; National Lamp Works, $70,000; all other works, general offices and district offices, $148,000.

Mexican Industrial Mission Makes Novel Business Trip to Mexico

E. M. Herr heads committee to strengthen business relations

E. M. Herr, president of the Westinghouse Electric & Manufacturing Co., has accepted the chairmanship of the committee which is organizing the American Industrial Mission to Mexico of 1924, for the American Manufacturers Export Association, 160 Broadway. Frank D. Waterman, president of the L. E. Waterman Co., is vice-chairman, and with William Wallace Nichols, president of the American Manufacturers Export Association, will co-operate with Mr. Herr in organizing the mission and arranging the details of the visit.

The other members of the committee, who represent the most important industrial interests of the country, are as follows:

D. E. Austin, managing director, the Nestle's Food Co.; A. J. Brosseau, president, Mack Trucks, Inc.; C. P. Coleman, president, the Worthington Pump & Machinery Corp.; D. E. Delgado, export manager, the Eastman Kodak Co.; E. W. Droosten, export manager, the Robbins & Myers Co.; Jas. A. Farrell, president, the U. S. Steel Corp.; C. S. Gawthrop, vice-president, the American Car & Foundry Export Co.; Julius Goslin, president, the Joubert Goslin Machine & Foundry Co.; N. J. Gould, president, the Gould Manufacturing Co.; J. Kindleberger, president, the Kalamazoo Vegetable Parchment Co.; James Logan, president, the U. S. Envelope Co.; Geo. R. Meyercord, president, the Meyercord Co.; M. A. Oudin, vice-president, the International General Electric Co.; C. G. Pfeiffer, vice-president, the George Borgfeldt & Co.; Wm. Pigott, president, the Pacific Coast Steel Co.; J. W. Potter, president, the Coal & Iron National Bank; Edward Prizer, chairman, the Vacuum Oil Co.; W. H. Robinson, vice-president, the H. J. Heinz Co.; G. A. Schieren, vice-president, the Chas. A. Schieren Co.; W. M. Sloan, treasurer, the McElroy-Sloan Shoe Co.; Geo. Ed. Smith, president, the Royal Typewriter Co.; F. H. Taylor, president, the S. S. White Dental Mfg. Co.; and S. M. Vauclain, president, the Baldwin Locomotive Works.

Official Escort

Word has just been received from Mexico City that Mayor Raya and high officials of the Mexican government would meet the American Industrial Mission at the border, at Laredo, with a special train and from then on the members of the Mission are to be the official guests of the government and the City of Mexico.

The Industrial Mission, which is limited to about a hundred members, expect to leave New York on Sept. 8 on a train which the Pullman Co. is to especially arrange for it.

Responses received from the invitations to join the Mission indicated a very pronounced desire on the part of the manufacturing, banking and exporting interests of the country to establish close industrial relations with Mexico.

In his invitation to American industrialists Mayor Raya, who represents the business and banking interests of Mexico City, expressed the hope that those who go to Mexico on the Mission will find very unusual opportunities for an interchange of commerce. With his country now settled down to a long run of industrial prosperity, Mayor Raya expressed the belief that American manufacturers will occupy a preferred status with Mexican purchasers and that a very large amount of business, profitable for both nations, will result from the visit of the American Industrial Mission.

Both the American and Mexican governments have so strongly approved the visit that it really is taking on a semi-official nature. The State Department at Washington not only gave its cordial sanction, but said that such a Mission at this time would tend to greatly strengthen the pleasant relations which have now been established. The Department of Commerce has fully approved the visit and may have one or more high officials on the Mission. In any event, the Mission will enjoy the support and co-operation of both government departments.

The Mission expects to leave Mexico City the night of Sept. 16 and reach New York five days later. On the way down one or more special cars will join the train at St. Louis, bringing those members of the Mission who live in Chicago and the Northwest. Exceptionally fast time will be made, both going and returning, with pilot engines ahead to assure safety. Schedules are now being arranged which promise to make this one of the most famous trains in American and Mexican railroading.

Plans Nation-wide Management Week

The national committee in charge of arrangements for Management Week, of which C. R. Stevenson, representing the National Association of Cost Accountants, is chairman, has compiled a list of sixty-five places where there are one or more local sections or chapters of the five organizations that co-operate in the activities during that period.

The rules of the Committee provide that in each locality where there is a permanent organization of any of the five participating societies, a local committee on arrangements shall be appointed, consisting of the chairmen of the local sections or chapters. Inasmuch, however, as all of the societies do not have permanent local organizations in every city where meetings are being planned, temporary appointments will be made by their respective national headquarters wherever that is found necessary.

In addition to the meetings to be held by the membership of the five societies in these cities, it is expected that the local committees will arrange to have their Chamber of Commerce and such organizations as the Rotary Club, Kiwanis, Lions, etc., devote their meetings during the week beginning Oct. 20 to management subjects. The slogan for the week is, "Better Management Through Budgeting." The local committees will also be encouraged to develop meetings or management in the schools and colleges, and also to have broadcast each night from each of the large stations of the country a talk on some phase of management.

The organizations which are supporting Management Week are the American Management Association, American Society of Mechanical Engineers, National Association of Cost Accountants, Society of Industrial Engineers and Taylor Society. Information regarding general plans for Management Week may be obtained by addressing the Secretary of the National Committee, Ernest Hartford, 25-33 West 39th St., New York, N. Y.

The places where committees are to be appointed are as follows: Akron, Albany, Schenectady, Atlanta, Baltimore, Birmingham, Boston, Bridgeport, Buffalo, Charlotte, Greenville, Raleigh, Central Pennsylvania, Chattanooga, Chicago, Cincinnati, Cleveland, Colorado, Columbus, Detroit, Dallas, Erie, Vermont, Hartford, Hawaii, Houston, Indianapolis, Spokane, Kansas City, Knoxville, Lehigh Valley, Los Angeles, Louisville, Memphis, Milwaukee, Minneapolis, St. Paul, Meriden, Oklahoma, Nebraska, New Britain, New Orleans, New Haven, New York, Ontario, Oregon, Grand Rapids, Philadelphia, Pittsburgh, Plainfield, Providence, Rochester, St. Louis, San Francisco, Savannah, Syracuse, Toledo, Iowa, Utah, Utica, Virginia, Washington, D. C., Waterbury, Western Massachusetts, Seattle, Worcester.

Canada Leads as U. S. Machinery Buyer

Canada and Mexico in 1923 occupied first and fifth positions, respectively, among the countries of the world as markets for American machinery. In 1923 Canada absorbed an amount valued at more than $27,000,000 and Mexico nearly $8,000,000 worth. United States machinery exports to Canada nearly equaled those of all the European countries combined and were almost twice the machinery exports to the United Kingdom in 1923.

In 1921 Mexico stood in first position among the countries of the world as a market for American machinery with purchases from the United States amounting to $30,784,076. In 1922 Mexico ranked fourth, taking American machinery worth $8,741,456. Canada has thus pre-empted Mexico's former position of first place without, however, approaching Mexico's 1921 figure.

France Enjoys Good Business During the First Six Months

Industries busy and prospects for future prosperity are good

The French custom house statistics for the first six months of 1924 show that imports, of raw material for use in industry, as compared with the same period in 1923, increased over 3 billion francs; in manufactured articles 450 million francs. The showing might be considered exceedingly disadvantageous except for the fact that exports in the same period increase to the extent of 1¼ billion francs and 5¼ billion francs respectively.

In June imports were stationary, but there was a falling off in exports of 450 million francs from the figures of the previous month. For the coming six months, whatever may be the industrial exports and imports, the general showing will be less favorable in that the importation of wheat and possibly other food stuffs.

The United States shows an increase of exports to France in steam and other machinery of 46 per cent over those of the year before, a decrease of 60 per cent on boilers and an increase of 40 per cent on tools and hardware.

In spite of the growth of export business it is not sought as eagerly as the French department of foreign commerce says it should be. It is still in the hands of a comparatively few producers in most branches of the metal trades.

AUTOMOBILE EXPORTS

One of the chief items of imports of the last month was 700 automobile units from the United States, this out of a total of 857, of which Italy's part was 141. There were but two motor trucks imported during the month. Exports were 4,111 units, of which 1,170 went to Belgium, 533 to Great Britain, 489 to Spain and but 20 to the United States. Motor trucks were exported to the number of 417 and of these 35 went to the United States.

French manufacturers of light cars are finding home and foreign business very satisfactory; those producing big cars are slowing down. Orders for industrial machinery are of no great magnitude, due in part to the mid-year lethargy brought about by the unsatisfactory economic state of affairs pending the modification of Franco-German relations incident upon the adoption, or rejection, of the Dawes plan. The production of agricultural machinery, as well as of sales, is on the increase, but there is a falling off from the heavy buying of the early part of the year.

In spite of the low stabilization of the franc (19.60 to the dollar and 85 to the pound sterling), metallurgical products have risen but little in price. The building trades are fairly active, suggesting a satisfactory demand for iron and steel construction materials and building hardware. The railways with increased receipts—due to the nearly 50 per cent raise in fares three months ago—are buying more equipment in all lines.

The Bank of France financial statement shows a still abnormally high note issue, nearly reaching 40 billion francs and advances to the government have increased, with a gold reserve, here and abroad, of 5,840,000,000 francs.

The Mechanics' Federation is still proceeding with its standardization schedule in which it is supported by the Electric Syndicate, and this should tend to reduce costs to the consumer if production expenses go no higher. Semi-manufactured metallurgical lines are the first to show results which perhaps accounts for the little variation in prices of steel bars, blooms and billets as well in ordinary grades such as tool steel.

The new minister of commerce in the Herriot cabinet is about to present a law for parliamentary adoption affecting the regime of patents and trademarks wherein the life of the French patent, or brevet, is to be extended from 15 to 20 years. The same official is also advancing a project for the economic reorganization of the country based on statistics which will be gathered, classed and centralized, the chief feature of which will be a periodical census, or inventory, of raw materials indigenous to France and its colonies.

The new ministry of education is leaning towards the development of manual and technical education rather than a strict adherence to the classical forms which have hitherto played so important a part in government schools and universities. The idea is to form a specialized corps of technicians in many trades and professions where they have been lacking hitherto, thus leading to the increased employment of machinery and unskilled labor, the latter being at the moment largely recruited in French North Africa. The turnover of labor in the metal trades of the Paris district is approximately 30 per cent a month at the present time.

News of the Automotive Industry

Net income of the Moon Motor Car Co., St. Louis, in the first half of the year amounted to $401,000, equivalent to $2.23 a share on the 180,000 shares of no par value capital stock, it was announced recently. This showing is at the rate of $4.46 a share for the year and compares with $4.67 a share earned last year. Operations in June showed an increase over those of June, 1923, this being the first month of the year to show a betterment, and it was indicated that the third quarter would be the company's best of the year.

Contracts have been awarded for immediate construction of a standard assembly plant at Norfolk, Va., by the Ford Motor Co. This will be its thirty-first assembly unit in the United States, adding about 90,000 cars yearly to domestic capacity.

The Mack Trucks, Inc., reports for the quarter ended June 30 net profits of $2,020,308, after all charges and deductions. After allowing for regular dividends on the first and second preferred stocks the company reports a balance equal to $6.14 a share earned on the 283,108 shares of common stock outstanding. This compares with $4.04 a share earned in the first quarter of the current year and $7.89 a share earned in the second quarter of 1923. For the half year ended June 30, 1924, the company reports earnings equal to $10.18 a share on the common stock after all preferred dividends.

July production of the Hudson Motor Car Co. totaled 13,205 Hudson and Essex cars, against 10,625 in July, 1923. Since the first of the year output of Essex Sixes exceeds 52,000 against 41.999 Essex Fours in the 1923 period.

Clayton Burt Succeeds Bryant Blood

Clayton R. Burt who has been appointed successor of Bryant H. Blood as vice-president and general manager of the Pratt & Whitney Co., Hartford, Conn., as was announced in the *American Machinst* last week, has entered upon his duties. Mr. Burt, who is a native of St. Johnsbury, Vt., served his apprenticeship at the Brown & Sharpe Manufacturing Co. plant in Providence, R. I., where he was employed twelve years. After a period with the Barber-Colman Co. at Rockford, Ill., he became general manager of the Russell Motor Car Co., at Toronto, Can. He was general manager of the New Process Gear Co., and just previous to coming to the Pratt & Whitney Co. was president and general manager of the Austin Machinery Co. During the war he supervised the equipping of six munition plants in Canada for the government. He is a member of the American Society of Automotive Engineers and the Machinery Engineers Society of New York.

Clayton H. Burt

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By Theodore H. Price
Editor, *Commerce and Finance*, New York

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NEARLY a century ago a man named Morgan threatened to disclose the secrets of Freemasonry. It was rumored that the Masons set him adrift in the Niagara River and that his body was subsequently found below the Falls. No one could prove the story and the corpse was never identified, but Freemasonry was then a political issue and one of the leaders of the anti-masonic party said "It's a good enough Morgan until after the election." The phrase is still current and is recalled by the efforts that followers of La Follette are making to give currency to a rumor that the Davis campaign is being financed with Wall Street money. No one in Wall Street believes this report, but it is gaining credence elsewhere and it may be "A good enough Morgan until after the election."

Taken in connection with the qualified support that the American Federation of Labor has pledged to La Follette, it has made close observers apprehensive that the choice of a President may be thrown into the House.

This apprehension probably accounts for the quieter tone of the speculative markets last week. Perhaps it is just as well that they should have been checked for a continuous advance might have created a dangerous situation. But the reactions recorded in wheat and corn are relatively unimportant and on a government report which indicated slight increases in the prospective grain crops there was some recovery.

The government report on cotton was lower than expected, but rains in Texas since the date of the report's compilation were reflected in the decline which followed its publication.

But when one gets away from the mercurial exchanges he cannot fail to be impressed with the return of confidence everywhere noticeable. Cotton goods are moving in better volume. So are woolens, and there is a striking improvement in the demand for both raw silk and silk fabrics.

Here are some of the headlines in the trade papers. "Textile Lines Gain in Chicago." "Farm Prosperity is Here." "General Trade Gain Presaged by Silk Rise." "Wool Outlook Improving as Orders Increase." "Business Outlook Better." "Seven Kansas Banks to Re-open." "New Business Reflects Gain in Trade." "Trade Reviews Show Improvement." "Business Outlook Better." "Northwest Banks in Good Condition." "West Preparing for Brisk Trade." "Frozen Credits Thawed by High Wheat."

Supplementing all these there are predictions of better times and increased activity from such men as Arthur Reynolds of the Continental and Commercial Bank in Chicago; H. C. Bedford of the Standard Oil Co. of New York, and Z. G. Simmons of the Simmons Bed & Furniture Co. as well as from the Harvard Economic Service and others who make a business of prophecy.

What's Doing in Industry

During the past week sales of machinery and machine tools in the various centers of the United States were not recorded to any appreciable degree, but inquiries and indications of future business were seen in nearly every part of the country with the South and Middle West leading. Japanese buying is expected, railroad buying of more than actual necessities is anticipated, and automobile production is being slightly increased, which should augur well for the machine tool industry.

The Van Sweringen Nickel-Plate and C. & O. consolidation was the topic of conversation in the railroad, machinery and financial circles. It makes the fourth largest railroad system in the country and the first consolidation under the Transportation Act of 1920.

Business in electrical goods decreased since the first of August, due partially to seasonal causes and partially to a general let-up in demand. The year so far, however, has shown a good business.

The stock market, which started off two weeks ago briskly with plenty of trading and advancing quotations, has slowed down and trading has been both irregular and hesitant with prices at a standstill.

The adoption of the Dawes plan in Europe is expected and with it better export business for the United States with European credits much improved.

Optimism is in fact so widespread and unanimous that those whose policy it is to sell on good news are commencing to advise caution, and it is to be admitted that no further preachments of prosperity are necessary at this particular time.

Proof of the prosperity proclaimed must soon be forthcoming if it is genuine and while the Bank Clearings have for months shown that more goods were changing hands, corroborative evidence of this fact should soon be found in car loadings, railway earnings, and the other indicia of commercial activity. Thus far railway traffic has been rather disappointing, but an increase is indicated by the weekly car loadings recently reported.

More building is predicted for the autumn and the winter, although there are 49 millions of unsold brick in New York City at present and there is "A buyer's market" for all other building material except lumber.

Hides, rubber and sugar are, however, higher. A palpable improvement in the shoe industry is reported. An appreciation of the small stocks of rubber held in this country has caused an advance of 2 cents and the talk of a reduction in the duty has served to draw attention to the relative cheapness of sugar.

In the steel industry there are also signs of better things ahead. The trade papers predict more buying and the mills are getting ready to increase their output.

The copper trade was quite excited one day last week by an advance to 13¾ and it seems to be generally understood that those who control the copper market are now in favor of a moderate advance.

Stocks and bonds also reflect confidence and cheap money. The Liberty issues have made new high records and most foreign securities are higher.

Foreign Exchange is advancing with sterling and francs in the lead and London is again commencing to talk about "par for the Sovereign."

All this reflects the very confident belief that the Dawes plan will be accepted and that a loan of $200,000,000 to Germany will shortly be arranged. In New York the terms are already being discussed and there is a general agreement that the rate ought to be at least 7 per cent.

The Industrial Review

Progress of the machinery and machine-tool business in various parts of the country

THE following reports, gathered from the various machinery and machine tool centers of the country, indicate the trend of business in these industries and what may be expected from the future:

Detroit

Spotty sales and scattering orders appear to be the rule of the day in Detroit at the present time with inquiries coming to machinery and machine tool firms only from those who are ready to purchase immediately.

Special efforts are being made by many of the automobile plants to keep their activities under cover, and some machine tool leaders have been asked to refrain from letting it be known that any purchases are being contemplated at the present.

The smaller machinery firms are finding the sledding rather hard, while the larger ones report business to be but fair. The reaction on the industry of the present slump in automobile production cannot be over-estimated.

Although automobile manufacturers are anticipating more extensive operations than have governed production in the last month, they are proceeding with caution and planning only for the immediate future. Costs are being trimmed to the bone and production gaged to meet immediate sales requirements.

Best opinion in the industry has it that August will see an appreciable gain in sales, particularly in the farming districts. Several manufacturers who are now on a healthy manufacturing basis find themselves there as the result of the introduction of new models. While the introduction of new models has unquestionably stimulated business in some quarters it has failed to measure up fully to the desired effect, in certain instances.

No material improvement in business conditions is expected now until early fall.

Canada

The outlook in the metal markets of Canada continues to grow brighter with an encouraging increase in demand. The movement is not sufficiently voluminous as yet to indicate a permanent recovery, but the situation is much better than it was a couple of weeks ago. Small inquiries are fairly plentiful and the aggregate tonnage is considerable. Demand for machine tools continues favorable and buyers are entering the market for practically all lines of equipment. Sales are, however, mostly for one or two tools to a purchase. Several small lists have made their appearance during the past few days. Small tools continue to move freely and business in second-hand and rebuilt equipment is good.

Reports from industrial centers in eastern Canada are to the effect that scrap metal dealers while complaining of a dearth of business say that some call from foundries and general industry has stimulated business. The steel mills are not buying, but appear to be carrying on their limited schedule of operation from stock.

There is some structural steel business passing, and there is keen competition for all new contracts. A fair amount of miscellaneous business in semi-finished steel products still comes to hand. This is made up almost entirely of small lots, indicating that manufacturers are still pursuing the same cautious policy in their purchases. The British Empire Steel Corp. plants at Sydney are closing Aug. 9 for ninety days, according to an official announcement. A single blast furnace may be kept in operation. This, together with the closing of the Algoma rail mill at Sault Ste. Marie and the operation of a single blast furnace at that point leaves the Canadian steel industry in an extremely quite state. Pulp and paper manufacturing and mining continue active.

A continuation of the moderately upward movement that employment has shown in recent months was recorded in July, although the improvement was less pronounced than in the preceding month and also than in the corresponding month last year.

Canadian bridge companies are deeply interested in the recent announcement that the Montreal Harbor Commission has been given authority by the federal government to construct a new bridge across the St. Lawrence River to connect with the south shore. Construction work will likely commence next year, and the bridge will cost in the neighborhood of seven million dollars.

After creating a record in delivery of cars this year, the National Steel Car Corp., Ltd., of Hamilton, Ontario, has closed its plants for an indefinite period owing to lack of orders. The Canadian Pacific Angus shops closed down from July 25 to Aug. 4 and the main shops of the system on the western lines also closed down on July 29 for several days.

Indianapolis

Business during the last fortnight in machinery and tool circles here took on a much more optimistic note. The last two weeks has seen a slight revival in all lines of metal industry. While the improvement has been slight insofar as actual demand is concerned, there is a large number of inquiries in circulation and the trade believes these inquiries are certain to result in business, especially since the general economic aspect in this section of the country has improved so much.

The last week has seen some tool business from the automotive manufacturers, with prospects of more to come. The automobile manufacturers here, confident that the increase in farm prices means more fall business, have begun increasing their production somewhat. They are feeling their way at the present time, but reports from their agents in all sections of the country are very optimistic for fall business. This confidence on the part of the manufacturers has reacted favorably on the accessory manufacturers, including body factories. Many plants are planning some replacements before winter.

Business with specialized machinery dealers in coal mining machinery is a little more active. Most mines report no market, but they are getting ready for the business that is sure to come this fall. The mine properties generally have been neglected this summer and as a result many repairs and much new machinery will have to be added before capacity production can be reached. Business in flour milling machinery has taken a sudden jump, according to officials of the Nordyke & Marmon here, with better business expected this fall.

Demand from railroad and utility sources continues somewhat below expectations. Some shops that have been closed most of the summer show no indications of reopening and other shops have curtailed their working days during the last week or two.

Southern District

Demand for machine tools and metal working machinery continued to experience a slow but steady improvement during the last ten days of July, with the result that the volume of business enjoyed by Atlanta distributors during the month compared very favorably with the sales volume during the earlier months of the year when business was unusually brisk. Compared with the corresponding month in 1923 sales appear to have been around 12 per cent better, while quite a betterment also was noted over sales volume in June.

As has been the case for some time, the Southern railroads still are among the most active buyers of heavier equipment, and distributors in Atlanta are of the opinion that this business will continue to hold up well for another two months at least. Sales to the railroads this year have been sufficiently large to date so that 1924 will undoubtedly prove one of the best years in equipment sales to this source in the history of the Southern trade. Inquiries from this source in the past two weeks have been large enough to indicate that August business will show little or no abatement.

Sales of road building machinery have quieted down a little, but still are

fairly satisfactory and running better than during the corresponding period in 1923. This business also bids fair to establish one of the best records this year in the history of the Southern trade, and with virtually all Southern states planning an increased road building program for the next year, there is promise of still better business to come.

Smaller machine shops and service stations are doing some buying, but on no extensive scale, and mostly for small tools and minor equipment. The largest part of this business during the past two months has been in used and rebuilt equipment, with buyers looking for the lowest prices they can secure. There is not much promise of any early improvement in this field.

Textile plants are buying on about the same basis as during July, which is better than two months ago, but still running considerably below the volume of sales to this source last year. The textile outlook gives promise of an early improvement, though distributors are not looking for any extensive buying for some time to come.

High cotton prices and other agricultural prices give promise of a good late summer and fall business, and most dealers are looking for sales to run along on a fairly brisk basis up to November at least.

In export sales the Birmingham district reports July volume entirely satisfactory, principally in railroad equipment, with indications that August business will hold up to about the same level.

Milwaukee

Although predicated upon needs to be filled later rather than immediately, inquiry for metalworking equipment is developing in a much more encouraging manner than has been the case for more than four months. It really is the most substantial sign of improving trade that has become noticeable since Spring. Immediate business during the first half of August has been of the so-called pickup variety, evidently being strictly confined to imperative requirements.

Announcement of the selection by Charles W. Nash of Kenosha, Wis., of David M. Averill, formerly of the Dort Motor Co., Flint, Mich., as vice-president and general manager of the new Ajax Motors Co. of Racine, Wis., has furnished the machine tool trade much encouragement. It is another important step toward the utilization of the former Mitchell Motors Co. works at Racine, Wis., acquired by the Nash interests last January. Progress toward perfecting a new management and production organization is steadily advancing the time when the large prospective acquisition of manufacturing equipment will be placed by the Nash interests. Thus far no detail concerning specifications has been made public, but the requirements undoubtedly will be the largest placed before the trade in some time, for the Mitchell plant, covering more than 34 acres, was purchased bare of all equipment.

The city of Milwaukee closed bids Aug. 12 for two lathes, one 16 and one 30 in., for the service department of the new Riverside pumping plant. Considerably more tools and machinery remain to be purchased for this project, and details will be issued from time to time.

The local trade expects soon to be in possession of specifications for at least part of the extensive equipment of the machine shop and service department of the municipal sewage disposal plant on Jones Island, Milwaukee.

New York

Actual sales of machinery and machine tools in the New York district were lacking during the past week, except for single tools and some railroad orders that have been expected for some weeks past. The Pennsylvania Railroad made several purchases as did some of the Southern railroads. Otherwise there was but little business transacted.

But inquiries are coming in with increasing frequency which presages good business during the last weeks of the month and the following weeks in the fall. Not only railroads, but also automobile makers and general industrials including the big electric companies are mentioned as being among those that are sending out lists.

Japanese orders are expected by machine tool builders and some of the larger dealers are also making bids for sales to the Shibaura Engineering Co. of Japan. Actual orders, amounting close to a million dollars, are expected within the next six weeks.

Exporting generally has been good during July and the first weeks of August and it is believed that the twelve month record for 1924 will be well ahead of 1923.

Dealers in used tools do not report any improvement in business. Up until July 1 orders were being received with some regularity, but since that date both order and inquiries have been slow.

What the Railroads Are Doing

Semi-official announcement was made by bankers recently of the proposed consolidation of the Nickel Plate, the Chesapeake & Ohio, the Hocking Valley, the Pere Marquette and the Erie into a single railroad system with total assets of approximately $1,500,000,000 and a total trackage of 14,357 miles, including all third and fourth tracks and switches. This undertaking, the largest merger to date under the Transportation act of 1920, is being engineered by the Van Sweringen interests of Cleveland, supported by the First National Bank and J. P. Morgan & Co.

The Missouri Pacific Railroad and its subsidiary, the American Refrigerator Transit Co., have ordered new equipment valued at $7,900,000, according to an announcement by L. W. Baldwin, president. Contracts include 1,000 automobile cars for the Missoury Pacific and 2,000 refrigerator cars for its subsidiary.

Railroads of the United States and Canada are in the market for $10,000,000 worth of equipment and rails, it was reported recently. Orders and inquiries for rails alone in the last week have represented purchases amounting to more than $4,000,000. Delivery in each instance was for the second half of 1924.

June net income of the class one railroads of United States was $65,528,960, compared with $88,287,500 in June last year and $60,653,877 in May, 1924, according to the reports compiled by the Bureau of Railway Economics and made public recently. This represents a net earning of approximately 4.09 per cent on the tentative valuation of the property figured on an annual basis compared with 5.47 per cent in the same month of last year.

Personals

HARRY W. BRECKENRIDGE, formerly with the Colburn Works of the Consolidated Machine Tool Corp. of America, A. A. GECK, formerly superintendent of the Colburn Works, and MR. BARROW have taken over the old Colburn plant, Cleveland, Ohio, and will conduct a general line of machinery and machine tool jobbing business.

ROSS WATSON, formerly district manager of the Cleveland district for the Chicago Pneumatic Tool Co., New York City, has been transferred to the Minneapolis branch as manager, succeeding D. M. WESBROOK.

DAVID AVERILL has resigned as vice-president and general manager of the Dort Motor Car Co., Flint, Mich., to accept a similar position in the new organization, the Ajax Motors Co. of Racine, Wis., owned and controlled by Charles W. Nash and associates in the Nash Motors Co., Kenosha, Wis. The Ajax company has been incorporated in Wisconsin to take over the management and operation of the proposed new production center in the works of the former Mitchell Motors Co. in Racine, Wis. Mr. Averill was associated with Mr. Nash for twelve years in the Durant-Dort Carriage Co. When the Chevrolet Motor Car Co. was first established, Mr. Averill was in charge of production in the Detroit works, later joining the Dort Motor Car Co.

F. E. MOSKOVICS has resigned as vice-president of the Franklin Automobile Co., Syracuse. He will continue to manage the affairs of the Stevenson Gear Co., Indianapolis, for which he was appointed receiver last November.

A. E. DEISHER is now president, vice-president and treasurer of the Royersford Foundry & Machine Co., Royersford, Pa.

JOHN G. OLIVER, of Bardons & Oliver, Cleveland, has been forced to discontinue his three months' business and pleasure trip to Europe, due to ill health.

O. G. RIVARD, a partner in the Liberty Machine Screw Co., Detroit, since its organization three years ago, has announced his retirement from the company. Samuel and Fred Baxendale, the other partners, will continue the

business. The company specializes in the manufacture of screw machine products.

J. CARROLL DEISHER has been made secretary of the Royersford Foundry & Machinery Co., Royersford, Pa.

ALEX. MITTENBERGER has been appointed Western executive representative of the Wagner Electric Corp., St. Louis with headquarters in San Francisco.

B. W. BEYER, JR., sales engineer for the Union Special Machine Co., Chicago, has been appointed sales engineer of the Industrial Works, Bay City, Mich. His headquarters will be in New York.

H. M. RICHARDS has been appointed district manager of the American Rolling Mills Co., Middletown, Ohio, in charge of the Cleveland district. His headquarters will be at 1,408 B. F. Keith Building.

H. R. WILLI has resigned as vice-president and secretary of the Royersford Foundry & Machine Co., Royersford, Pa.

HORACE A. BOND is the manager of the newly opened Albany office of Warren Webster & Co., Camden, N. J.

D. M. WESBROOK has been made the general manager of the Canadian Pneumatic Tool Co.

T. R. KELLER, general manager of General Motors of Canada, has been appointed vice-president of the company, and J. H. BEATON has been appointed general sales manager.

T. L. SULLIVAN, formerly of the Anaconda Copper Mining Co., Butte, Mont., is in charge of the newly opened Butte office of Warren Webster & Co., Camden, N. J.

J. B. DETWILER, formerly manager at Brantford, Ontario, of the Steel Co. of Canada, and later president and general manager of the Blue Bird Co. of Brantford, has been appointed general manager of the St. Lawrence Steel and Wire Co. at Gananoque.

ARCHIBALD MCCOLL, general manager of the British Empire Steel Corp. operations on the mainland, GEORGE D. MACDOUGALL, chief mechanical engineer, and WILLIAM G. WILSON, superintendent of mills, have all resigned.

L. J. WESTENHAVER has been transferred from the Pittsburgh office of the Chicago Pneumatic Tool Co., New York, to the Cleveland office.

WILLIAM A. BLACKBURN has been appointed vice-president of the D. McAvoy Manufacturing Co., Grand River, Mich.

W. L. MCCLELLAND will be manager of the newly organized Hughes Equipment Co., Allegan, Mich. Mr. McClelland was formerly with D. Stern & Co.

E. C. STROUP, compressor engineer in the Boston territory for the Chicago Pneumatic Tool Co., New York City, has been transferred to the Pittsburgh office.

JAMES C. PINNEY, for seven years dean of the College of Engineering, Marquette University, Milwaukee, has resigned, effective Aug. 31, to enter private practice in Milwaukee in affiliation with J. A. L. WADDELL, a bridge construction authority of New York.

F. W. BENTLEY, in charge of the department of draughting at the College of Engineering, University of North Dakota, Grand Forks, has accepted the appointment to a similar position on the faculty of the College of Engineering, Marquette University, Milwaukee. Mr. Bentley is a graduate of the University of Wisconsin and before joining the North Dakota university, was associated with the University of Minnesota for three years.

Business Items

The Edward G. Budd Co., of Philadelphia, builder of all-steel automobile bodies, has contracted to furnish all bodies for Citroen cars during the next fifteen years.

On Thursday, Sept. 4 the first of a series of machinery and machine tools auctions will be held by the Philadelphia Machinery Auction Co., at the plant of the Ace Motor Corp., Erie Ave. and Sepviva St., Philadelphia, Pa. The executive offices of the company are at 830 Commercial Trust Building, Philadelphia.

The Persons-Arter Machine Co., Worcester, Mass., has been reorganized and the name has been changed to the Arter Grinding Machine Co. The officers elected are: William Arter, president; William Arthur, vice-president; William Haig, Vernon Critchley and Harold Tattersall, directors.

The National Ball Bearing Co., of Newark, N. J., according to a recent announcement by A. J. Werner, president of the company, plans to establish a plant at Hickory, N. C., this year for the manufacture of reground ball bearings, to be in operation within the next few months.

The S. & S. Machine Works, Chicago, is moving from 4,522 Lexington Ave. to 4,539-4,541 W. Lake St.

Warren Webster & Co., Camden, N. J., have opened a new office at Butte, Mont. It is situated at 223 N. Main St.

The good will and patents of the Fraser Grinding Machine Co., Worcester, Mass., have been acquired by the Arter Grinding Machine Co., Worcester, Mass.

Obituaries

EDWIN S. MOLDENHAUER, secretary and general manager of the Milwaukee Die Casting Co., Milwaukee, died Aug. 2 from heart trouble after a brief illness. He was born in Juda, Wis., in 1874.

FREDERICK BOGENBERGER, president of the Consolidated Sheet Metal Works, Milwaukee, and prominent in the American sheet metal industry, died Aug. 4 at the age of 61 years.

IRVING H. PAGE, aged 65 years, died recently at Tolland, Mass. He was president of the Stevens Arms and Tool Co., the Stevens-Duryea Automobile Co., the Page-Lewis Arms Co., the Page Needle Co., the Page Paper Box Co., and the National Scale Co., all of Chicopee, Mass. He had been in poor health for some time.

FRANCIS S. SMITH, aged 59 years, for 18 years chief clerk of the motive power department of the Grand Trunk and Canadian National Railways at Stratford, Ontario, died at his home recently.

ALBERT TWING SPALDING, for the past several years secretary and one of the owners of the Spalding Foundry Co., Atlanta, Ga., died recently, at a private sanitarium in Atlanta, after a brief illness. Mr. Spalding was 63 years of age, and has been identified with the metal trades industries of the South for many years, becoming secretary of the Spalding company in 1917, and retaining that position to the time of his death. His brother, John S. Spalding, is president of the company.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Machines and other tools. Hamburg, Germany. Agency. Reference No. 11,182.

Machinery. Bahia, Brazil. Purchase and agency. Reference No. 11,145.

General machinery. Rio de Janeiro, Brazil. Agency. Reference No. 11,157.

Machines and dies for stamping and cutting metal letters. Sydney, Australia. Purchase. Reference No. 11,179.

Forthcoming Meetings

New Haven Branch of the American Society of Mechanical Engineers. Fourth annual machine tool exhibit, Sept. 15-18. Mason Laboratory, New Haven, Conn. H. R. Westcott, chairman.

American Society for Steel Treating. Sixth Convention, Boston, Mass., Sept. 22, 23, 24, 25 and 26. W. H. Eisenman, secretary, 4600 Prospect Ave., Cleveland, Ohio.

Motor and Accessory Manufacturers' Association. Annual meeting, Cleveland, Ohio, Week of Oct. 6.

American Foundrymen's Association. Twenty-eighth annual convention. Milwaukee, Wis. Week of Oct. 13, 1924.

National Industrial Advertisers Association. Annual meeting, Edgewater Beach Hotel, Chicago, beginning Oct. 13, 1924.

Management Week. Under the auspices of the American Society of Mechanical Engineers. Week of Oct. 20, 1924. New York City.

American Gear Manufacturers Association. Semi-annual fall meeting. Briarcliff Lodge, Briarcliff Manor, N. Y., Oct. 16, 17 and 18. T. W. Owen, secretary, 2443 Prospect Ave., Cleveland, Ohio.

American Society of Mechanical Engineers. Forty-fifth annual meeting. New York City. Dec. 1 to 4. Calvin Rice, secretary, 29 West 39th St., New York City.

National Exposition of Power and Mechanical Engineering. Grand Central Palace, New York City, Dec. 1 to 4. Charles F. Roth, 1102 Grand Central Palace Building, New York City.

Exposition of Invention. Engineering Societies Building, 29 West 39th St., New York City, Dec. 8 to 13 inc., General offices, 47 West 34th St., New York City.

The Weekly Price Guide

Rise and Fall of the Market

Iron and Steel—There has been some buying by several railway systems and an increased number of inquiries concerning track supplies. The Pittsburgh market remains unchanged from last week. Pig-iron quotations remain at $18@$18.50 per ton at Birmingham but changes for the other cities are listed.

Non-Ferrous Metals—Advances in the non-ferrous metals continues for the New York market. Also the New York quotations on old metals have advanced: copper, ⅛c.; tin, 2½c.; lead, ⅛c.; zinc, ⅛c. per lb.

(All prices as of Aug. 8)

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$22.05@22.55
Northern Basic	20.00
Southern Ohio No. 2	21.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	28.05
BIRMINGHAM	
No. 2 Foundry	18.00@18.50
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	22.77@23.27
Virginia No. 2	28.44@29.44
Basic	20.00@21.00
Grey Forge	21.00@22.00
CHICAGO	
No. 2 Foundry local	20.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	28.05
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.00
Basic	25.00
Bessemer	28.66

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	4.50@4.75
Cleveland	4.75@5.00
Cincinnati	5.00@7.50
New York	5.00@5.50
Chicago	5.25@5.75

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the mill base in large lots.

Blue Annealed	Pittsburgh Mill Base	New York	Cleveland	Chicago
No. 10	$2.70@2.80	3.89	3.55	3.80
No. 12	2.85@2.90	3.94	3.60	3.95
No. 14	2.95@3.00	3.99	3.65	4.00
No. 16	3.15@3.20	4.09	3.75	4.10
Black				
Nos. 17 and 21	3.50	4.40	4.25	4.55
Nos. 22 and 24	3.55	4.45	4.30	4.55
Nos. 25 and 26	3.60	4.50	4.35	4.60
No. 28	3.50@3.65	4.60	4.45	4.50
Galvanized				
Nos. 10 and 11	3.60@3.80	4.60	....	4.60
Nos. 12 and 14	3.70@4.90	4.70	....	4.70
Nos. 17 and 21	4.00@4.20	5.00	....	5.00
Nos. 22 and 24	4.15@4.35	5.15	5.00	5.15
No. 26	4.30@4.50	5.30	5.25	5.30
No. 28	4.60@4.80	5.60	5.55	5.50

WROUGHT PIPE (Welded)—Warehouse discounts are as follows:

	New York		Cleveland		Chicago	
	Black	Galv.	Black	Galv.	Black	Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	56%	43%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	53%	40%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 4%; class A, plus 23%. Cast iron, standard sizes, 36% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ¼-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
¼	$0.09	50%	⅝	$0.16	35%
⅜	.11	45%	1	.18	31%
½	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.20
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	7.50	8.00	6.55
Hoop steel	4.49	3.96@4.36	4.15
Cold rolled strip steel	7.00	8.25	7.15
Floor plates	5.55	4.60	5.50
Cold drawn shafting or screw	4.15	4.00	3.80
Cold drawn flats, squares	4.65	4.50	4.30
Structural shapes (base)	3.34	3.21	3.10
Soft steel bars (base)	3.24	3.11	3.00
Soft steel bar shapes (base)	3.24	3.21	3.00
Soft steel bands (base)	3.99	3.61	3.65
Tank plates (base)	3.34	3.43½	3.10
Bar iron (3.00 at mill)	3.24	3.21	3.00
Tool steel	11.00	....	....
Drill rod (from list)	60%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ¼, 7.85c.; 5/32 to ¼, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			13.75
Tin, 5-ton lots, New York			53.00
Lead (up to carlots), St. Louis	6.95	New York	8.00@8.125
Zinc (up to carlots), St. Louis	6.05	New York	6.875@7.00

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	27.10	28.00	28.50
Antimony (Chinese), ton spot	10.00@10.50	10.50	10.00
Copper sheets, base	20.125	19.75	22.50
Copper wire, base	18.50	17.50	21.25
Copper bars, base	19.375	20.75	22.00
Copper tubing, base	22.25	25.75	24.75
Brass sheets, base	16.50	20.50	19.25
Brass tubing, base	21.00	25.50	27.25
Brass rods, base	14.50	16.50	17.00
Brass wire, base	17.25	20.50	19.75
Zinc sheets (casks)	10.25	10.75	....
Solder (½ and ½), (case lots)	37.50	33.50	30.00
Babbitt metal (83% tin)	60.00	62.50	48@52
Babbitt metal (35% tin)	28.00	18.00	23@26
Nickel (ingot and shot) f.o.b. refinery	27.00	.....	.....
Nickel (electrolytic) f.o.b. refinery	30.00	.....	35.00
Nickel (F shot) f.o.b. refinery	30.00	.....	.....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb., f.o.b. Huntington, W. Va.:

Rolled nickel sheet (base)	52.00
Hot rolled rods, Grade "A" (base)	50.00
Cold drawn rods, Grade "A" (base)	58.00

Shop Materials and Supplies

METALS—Continued

Manganese nickel hot rolled rods "E"—low manganese (base) 54.00
Manganese nickel hot rolled rods "D"—high manganese (base) 57.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.:

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.75@11.25	10.25	9.50@10.00
Copper, heavy, and wire	10.50@11.00	10.00	11.00
Copper, light, and bottoms	9.50@10.00	8.50	8.00@8.25
Lead, heavy	6.25@6.75	5.00	5.00@5.50
Lead, tea	5.25@5.75	3.00	3.00@3.25
Brass, heavy, yellow	6.75@7.00	8.75	6.00
Brass, heavy, red	8.50@8.75	5.00	7.50
Brass, light	5.75@6.00	4.75	5.00
No. 1 yellow brass turnings	7.25@7.50	5.75	6.00
Zinc	3.75@4.00	3.75	2.50

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$23.50	$22.85	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	19.00	18.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	13.00	13.00	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	7.75	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.14@0.21	$0.20	$0.14
Cotton waste, colored, per lb.	.09@.14½	.17	.10½
Wiping cloths, 13½x13½, per lb	11.25*	36.00 per M	.16
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.16
Sal soda, per 100 lb.	2.40	2.25	2.65
Roll sulphur, per 100 lb.	3.60	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	1.05	1.14	1.05
Lard cutting oil, 25% lard, per gal.	.55	.50	.79†
Machine lubricant, medium-bodied (50 gal. wooden bbl.), per gal.	.29	.35	.214
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 24c. per lin. ft. per inch of width for single ply.			
Medium grade	40–2½%	30–10%	30–10%
Heavy grade	30–5%	30%	20–5–2½%
Rubber transmission:			
First grade	50%	50–10%	40–10%
Second grade	50–10%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$4.86	$5.84	$6.48
Emery paper	10.71	11.00	8.80
Emery cloth	28.00	31.12	29.48
Emery disks, 6 in. dia., No. 1 grade, per 100:			
Paper	1.49	1.24	1.40
Cloth	3.38	2.67	3.20
Fire clay, per 100 lb. bag	....	.65	.60
Coke, prompt furnace, Connellsville	per net ton		3.00@3.25
Coke, prompt foundry, Connellsville	per net ton		4.25@4.75
White lead, dry or in oil	100 lb. kegs		New York, 14.50
Red lead, dry	100 lb. kegs		New York, 14.50
Red lead, in oil	100 lb. kegs		New York, 16.00

*White, at washery.
†Chicago quotes on pure lard oil, No. 1 grade.

Comparative Warehouse Prices

New York	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0324	$0.0344	$0.0354
Cold finished shafting	per lb.	0.0425	0.0425	0.044
Brass rods	per lb	0.1450	0.140	0.1725
Solder (½ and ½)	per lb.	0.375	0.3375	0.295
Cotton waste	per lb.	.14@.21	.14@.21	.10@.13
Washers, cast iron (½ in.)	per 100 lb.	6.50	6.50	6.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	3.38	3.38	3.38
Lard cutting oil	per gal.	0.55	0.55	0.55
Machine oil	per gal.	0.29	0.29	0.297
Belting, leather, medium	off list	40–2½%	40–2½%	30–10%
Machine bolts up to 1x30 in.	off list	50%	50%	30%

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	50%	60–10–5%	60%
1½ and 1½x3 in. up to 12 in	15%	60%	60%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	40%	$3.50 net	60%
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	45%	3.50 net	60%
Button head bolts, with hex. nuts	10%	List net	.....
Hex. head and hex. nut bolts	10%	.....	.....
Lag screws, coach screws	50%	.....	65%
Square and hex. head cap screws	75%	75%	.....
Carriage bolts, up to 1 in. x 30 in.	40%	60%	55%
Bolt ends, with hot pressed nuts	50%	.....	60%
Tap bolts, hex. head, list plus	35%	.....	$4.65
Semi-finished nuts, ⅜ and smaller	70%	.....	.....
Semi-finished nuts, ½ and larger	65%	70%	.....
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.75
Washers, cast iron, ¾ in., per 100 lb. (net)	5.50	4.00	3.75
Washers, round plate, per 100 lb. Off list	1.50	4.50	4.50
Nuts, hot pressed, sq., per 100 lb. Off list	1.50	4.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.50	4.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.50	4.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.50	4.00	4.00
Rivets:			
Rivets, ⅞ in. dia. and smaller	50%	60–10%	70%
Rivets, tinned	50%	60–10%	70%
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.00	$3.50	$3.50
Cone heads, ditto (net)	5.20	3.60	3.70
1½ to 2-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅜ in. diameter *EXTRA*	0.35	.....	0.15
½ in. diameter *EXTRA*	0.75	.....	0.50
1 in. long, and shorter *EXTRA*	0.75	.....	0.50
Longer than 5 in. *EXTRA*	0.50	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.45	.....	$4.20 bze

Machine Requirements and Industrial Construction

Machine Tools and Equipment Wanted

Calif., Corcoran—Corcoran Union High School Dist., sheet metal working equipment. C. C. Wilson, Clk. of Dist.

Calif., Santa Rosa—Bd. Educ., S. N. Hatch, Secy., will receive bids until Aug. 25 for the following equipment:

1 Tannewitz type B Universal saw bench, complete with 5 hp. motor mounted on bracket attached to frame, belt and starter, or equal.

1 Hall & Brown No. 186, 36 in. band saw, complete with 3 hp. motor mounted on bracket attached to frame, wire mesh guards, frictionless roller guides above and below table, 2½ in. band saws, belt and starter, or equal.

1 Oliver No. 166, 16 in. jointer, complete with 3 hp. motor connected direct to cylinder, ball bearings, guards, safety cylinder, rabbeting attachment and starter switch or equal.

1 American No. 16 hand block belt sander, complete with 2 hp. motor, direct connected table and sanding pad and starter switch or equal.

1 Greenlee No. 225 B. M. vertical hollow chisel mortiser, built in motor, 1½ hp., starter, switch and four square hollow chisels and bits, ¼, ½ or ¾ in. or equal.

1 No. 585 Oliver oilstone grinder with direct connected motor drive or equal.

1 Oliver woodturning lathe with motor in head stock, 12 in. swing, 36 in. between centers, rear end face plate and floor stand and starter, motors to be A. C. 3 phase, 60 cycles, 220 volts or equal.

1 Greenlee No. 478 double arbor Universal saw bench, complete with 5 hp. motor mounted on bracket attached to frame, all guards, gauges, saws, belt and starter. Motors to be A. C. 3 phase, 60 cycles, 220 volts or equal.

Mass., Boston—Boston Violin Case Co., 97 Haverhill St.—36 in. band saw.

Mass., North Attleboro—Evans Case Co.—plain drop hammer from 500 to 1,000 lbs., 6 poppet, and large power press with 10 in. stroke, single action.

N. J., Paterson—R. Cahill, Marshall St., 1 band or circular saw.

N. Y., New York—Industrial Plants Corp., 25 Church St., 1 alligator shear; 1 No. 2-A Warner & Swasey lathe; 1 shaper; one 24x24 in. x 10 ft. Ingersoll slab miller; one No. 7 Upright Farrell pillar press; one 4-spindle 24 in. geared bull press; 1 automatic geared hobber; one 9 ft. brake; one 42 in. squaring shear; 1 No. 78 Bliss power press; one 36 in. motor driven lathe.

Tex., Amarillo—W. D. Hodgin, 1009 Van Buren St.—power saw, joiner, drill press and forge.

Wis., Appleton — Higginbotham & Reitzner, 892 College Ave., boring machine and air compresser.

N. S., Amherst—Nova Scotia Hardwood Products Co., woodworking machinery for new plant.

Ont., Brechin—Thomas Sherridan—drill press and grinder.

Ont., Coldwater — A. Johnston — drill press, lathe, etc.

Ont., Emsdale—J. A. MacDonald—band saws, rip and edging sawers, etc.

Ont., Midland—Hicks & Ballantyne—lathe, grinder, bench tools.

Ont., Orillia—J. R. Eaton & Sons, 14 Peter St.—band saw, buzz planers, etc. J. R. Eaton, 57 Coldwater St., Purch. Agt.

Ont., Orillia—Metcalfe & Shortt, 8 West St.—lathe and emery grinder.

Que., Acton Vale—J. E. Vincent—Equipment for sash and door manufacturing.

Que., Montreal—Cleo Picard, 943 Gouin Blvd. W.—complete equipment for new public garage and repair shop.

Que., St. Marguerite Village — Pepin Freres—band saws, planers, etc.

Italy, Milan—Giannino Negri, 14 Via Foro, steel, machine tools and machine shop equipment.

Italy, Turin—Amato Jalla, Bottero & Co., 24 Via Sacchi, steel and machine tools.

What This Section Is

Machinery Requirements and Industrial Construction is a reliable machinery market, because every item is reported first-hand by our own correspondents, scattered over the United States and Canada. These leads are verified by our men. We do not use newspaper clippings, nor do we listen to any hearsay or rumors. These sales leads are as accurate as our men can make them, and as timely as weekly publication will permit.

This market is for *American Machinist* subscribers. It covers the same machinery fields as does the paper. Here will be found inquiries for machine tools, presses, hammers, welding, forging and heat treating equipment, wood working machinery, cranes, hoists and other material handling machinery for the shop.

Here also will be found reports of proposed industrial construction, where sooner or later machinery will be needed.

Are you making the most of the opportunities listed here?

Opportunities for Future Business

Calif., Los Angeles—The Grinnell Co. of the Pacific, 520 Mateo St., is having plans prepared for the construction of a 1 story, 95x95 ft. pipe shop, on 4th and Mateo Sts. Austin Co. of California, 777 East Washington St., Engrs.

Ind., Muncie—Indiana Steel & Wire Co. has awarded the contract for the construction of a brick and steel galvanizing building on Jackson St., cost estimated at $80,000, also a machine shop to cost $25,000.

Mass., Boston — The Edison Electric Illuminating Co., 39 Boylston St., has awarded the contract for the construction of a one story plant. Estimated cost, $160,000.

Mass., Fitchburg—Simonds Saw & Steel Co., Main St., is receiving bids for the construction of a 3 story 150x50 ft. addition to its manufacturing plant, on Main St. Estimated cost, $120,000. John D. DeWolf, 45 Bromfield St., Boston, Engr.

Mich., Detroit—Ramp Garage Co., c/o Robert O. Derrick, Archt., 120 Madison Ave., has awarded the contract for the construction of an 8-story, 90 x 120-ft. garage on Elizabeth St. and a 6-story, 120 x 160-ft. garage on Cass Ave. and Larned St.

Minn., Minneapolis — Powers Mercantile Co., 5th St. and Marquette Ave., has awarded the contract for the construction of a 1 story, 109 x 150 ft. warehouse and garage at 813 Western Ave., Estimated cost, $200,000.

N. Y., Buffalo—Pratt & Letchworth, 189 Tonawanda St., are having plans prepared for a 2 story, 50 x 150 ft. casting mill on Tonawanda St. Machinery for powdering and crushing coal will be required. Estimated cost $40,000.

N. Y., Buffalo—Vendome Realty Corp., 1012 Marine Trust Bldg., is having plans prepared for a 6 story, 150 x 200 ft. garage on Ellicott St. Estimated cost $200,000.

N. Y., Lackawanna—The Bethlehem Steel Co., Bethlehem, Penn., plans to construct rolling mills, here. Estimated cost $500,000.

N. D., Minot—Dakota Lignite Products Co., plans to install four additional carbonizing ovens and replace old briquetting equipment with new at Minot plant, also construct ten additional carbonizing and briquetting plants at other locations.

O., Cleveland—Bishop Products Co., G. Bishop, Pres., 7512 Carnegie Ave., manufacturer of auto accessories, etc., has awarded the contract for the construction of a 2 and 3 story, 58x100 ft. factory on Carnegie Ave. Estimated cost, $40,000.

O., Cleveland—Bulkley Building Co., c/o Robert Bulkley, Bulkley Bldg., has awarded the contract for the construction of a 2 story, 124x190 ft. and a 4 story, 70x135 ft. garage at 1501 Euclid Ave. Estimated cost, $250,000.

O., Cleveland — The Cleveland Railway Co., c/o G. L. Radcliffe, Vice Pres. and Gen. Mgr., Hanna Bldg., had preliminary plans prepared for the construction of a 2 or 3 story garage, on Central Ave., near East 9th St. Estimated cost $150,000. The Watson Co., 4614 Prospect Ave., Archts.

O., Cleveland — Louis Loveman, 2294 East 55th St., plans to construct a 2 and 3 story, 100x250 ft. garage at 5336 St. Clair Ave. Estimated cost $150,000.

Pa., Johnstown — The Bethlehem Steel Co., Bethlehem, plans to build a coke preparing and mixing plant. Estimated cost, $500,000. A. J. Keilar, Bethlehem, Corporation Engr.

Tex., Coleman—The West Texas Utilities Co., is having plans prepared for a machine shop. Earl Hoppe, Abilene, Supt., Adams & Adams, Gibbs Bldg., San Antonio, Archts. Estimated cost $40,000.

Ont., Sarnia—Dominion Alloy Steel Co. has awarded the contract for the construction of a 1-story, 100x506 ft., 30x286 ft. and 45x506 ft. factory at South Sarnia.